RFI REPORT AND STABILIZATION/CORRECTIVE MEASURES PLAN
Volume I of II

MONSANTO NITRO PLANT

May 5, 1995

Prepared for:

MONSANTO COMPANY
No. 1 Monsanto Road
Nitro, West Virginia 25143

Prepared by:

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ROUX

SIGNATORY AUTHORIZATION
FOR HAZARDOUS WASTE PROGRAM DOCUMENTS

1. DELEGATIONS: Pursuant to the requirements of the United States Environmental Protection Agency and the appropriate state and local governmental agencies, the individuals occupying the positions listed in item 2 below are hereby authorized to execute documents required or requested by governmental environmental authorities connected with hazardous waste permitting at the Nitro Plant located at 1 Nitro Road in Nitro, West Virginia, except as limited below.

2. TO WHOM DELEGATED: Director, Manufacturing and Nitro Coordinator-Manager Remedial Projects.

3. LIMITATIONS:

a. The above delegatees are authorized to sign permit applications, variance requests, special agreements, compliance orders and information request responses with advice of counsel from the Environmental Law Group and after consultation with the Director, Environmental Operations, or such Director's designee.

b. This authorization must be submitted to the Chief, Waste Management Section, Department of Natural Resources, prior to or together with the first document signed and submitted by one of the above delegatees pursuant to this authorization.

4. REDELEGATION AUTHORITY: None.

5. REFERENCES:

a. West Virginia Code of State Regulations, Title 47, Series 35.

b. United States Environmental Protection Agency - 40 C.F.R. §270.11.

Monsanto Company

By R. G. Potter

Title: Corporate Executive Vice President

Date: 5/2/94

Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including, the possibility of fine and imprisonment for knowing violations.

Permittee: Monsanto Company

Permit No.: WVD 033990965

Facility Address: No.1 Monsanto Road
Nitro, West Virginia 25143

Name: Anthony C. Tuk

Title: Nitro Coordinator
Manager Remedial Projects

Signature: Anthony C. Tuk

Date: May 3, 1995

Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including, the possibility of fine and imprisonment for knowing violations.

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Name: Anthony C. Tuk

Title: Nitro Coordinator
Manager Remedial Projects

Signature: Anthony C. Tuk

Date: May 3, 1995

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EXECUTIVE SUMMARY

This report summarizes the results of investigations conducted to fulfill requirements of the Monsanto Chemical Group's Nitro, West Virginia facility Resource Conservation and Recovery Act (RCRA) Corrective Action and Waste Minimization Permit (Permit). Specifically, this report constitutes the RCRA Facility Investigation (RFI) Report and Stabilization/Corrective Measures Plan as required under the Permit. The Permit specifies fourteen Solid Waste Management Units (SWMUs) at the facility subject to RCRA, and identifies the environmental media to be investigated (ground water, soil, sediment, and surface water). Ground-water investigations are specified in the Permit for all but one of the SWMUs, whereas investigations of other environmental media (soil, sediment, and surface water) are specified for three of the fourteen SWMUs.

The Permit's emphasis on ground-water investigations is consistent with the findings of the RCRA Facility Assessment (RFA) conducted at the facility in 1986. The RFA and subsequent investigations indicated ground water across the site contains volatile organic compounds (VOCs). The Facility Sewer System SWMU historically conveyed many of these VOCs as part of the normal process wastewater flow to the Wastewater Treatment Plant. This SWMU is the focus of an individual stabilization measure evaluation program, which is being performed by the facility concurrently with the RFI implementation process. The appropriate investigative elements for the remaining SWMUs were identified in the facility's approved RFI Work Plan. Specifically, the objectives of the RFI were to:

- characterize the nature, extent, concentration, and migration of hazardous constituents released from SWMUs into ground water and surface water;

- identify actual or potential receptors;

- provide a detailed geologic and hydrogeologic characterization of the area surrounding the SWMUs; and

- determine the need for and scope of corrective measures.

The RFI field investigations were conducted in August and September of 1994. RFI activities included the installation of soil borings, completion of monitoring wells and performance of aquifer tests to determine site geologic and hydrogeologic characteristics. Water-level measurements were obtained from the facility's monitoring well network to characterize the direction, gradients, and rate of ground-water flow in the aquifer beneath the facility, and to assist in identification of potential receptors. Other RFI activities included sampling various media to investigate the potential for past releases at specified SWMUs. Soil samples were collected in the vicinity of the Building 46 Incinerator and the Kanawha River riverbank. Sediment and surface water samples were collected from the Past Disposal Area. Ground-water sampling was conducted at monitoring wells throughout the Process Area and the Waste Treatment Area to obtain site-wide ground-water quality data.

The geology of the site is characterized by fill overlying deposits of the Kanawha River Valley. The lithology transitions from silt and clay in the upper 20-30 feet of alluvium to medium sands which become coarser in the deeper alluvium deposits. Bedrock is encountered at approximately 55 feet below ground surface (BGS) at the facility. Ground-water flow in both the alluvial deposits and bedrock is toward the Kanawha River which represents a major regional discharge boundary.

Surface-water sampling results indicate that hazardous constituents are not present above levels of concern. Analytical results for sediment samples indicated low levels of base-neutral and acid extractable semivolatile organic (BN/AE) compounds and inorganic metals. Analytical results for samples collected along the bank of the Kanawha River indicate the presence of BN/AE compounds. Soil samples collected near the Building 46 Incinerator show low levels of VOCs, BN/AE compounds, and metals. The observed low levels of detection are not indicative of residual source areas which would require corrective action.

Ground-water sampling results show that shallow ground water is impacted by VOCs, BN/AE compounds, and inorganic metals. Dioxin and dibenzofuran compounds were not detected in the facility's ground water. As observed inorganic concentrations are representative of typical background levels, primary ground-water constituents include trichloroethene (TCE), benzene, and various chlorinated phenols. The distribution of these constituents in ground water indicate three potential areas of concern. These include the following three SWMUs: the Past Disposal Area; the former City of Nitro Dump; and the Facility Sewer System, which is the subject of a separate stabilization measures work plan.

There is no local use of ground water or surface water for potable supply, and observed concentrations of constituents in these areas of concern are not considered a threat to human health. The Kanawha River is the sole discharge point for site ground water and represents the primary receptor to be considered for protection of the environment. The evaluation of appropriate stabilization/corrective measures in the primary areas of concern will include this as a primary objective. A site-specific risk assessment will be performed to verify the constituents of concern, establish the remedial action objectives, and select the optimum stabilization/corrective measures.

Any corrective action plans for these primary areas of concern will also include evaluations for potential waste minimization and source control measures as part of the facility's comprehensive program. Numerous successful waste minimization projects have been completed at the facility including upgrades to the Wastewater Treatment Plant (WTP), voluntary air emissions reductions, odor abatement, and WTP effluent toxicity reductions. The facility is committed to continuing its emphasis on source control and stabilization measures as the most effective means of corrective action.

1.0 INTRODUCTION

Roux Associates, Inc. was retained by Monsanto Chemical Group (Monsanto) to conduct environmental investigations at the Monsanto facility located in Nitro, West Virginia. The investigations are being conducted under the Resource Conservation and Recovery Act, and this document constitutes a RCRA Facility Investigation Report and Stabilization/Corrective Measures Plan. This report has been prepared to summarize the results of investigations conducted to fulfill requirements of the facility's RCRA Corrective Action and Waste Minimization Permit (USEPA ID No. WVD 033990965) issued on November 2, 1990 by the United States Environmental Protection Agency (USEPA).

The Permit applies to Solid Waste Management Units at the facility subject to RCRA. The Permit specifies 14 SWMUs to be investigated and the environmental media (ground water, soil, sediment, and surface water) to be investigated for the various SWMUs. The selection of the specific environmental media to be investigated is based on the RCRA Facility Assessment previously conducted for the facility. The results of the RFA are described in the document titled "Phase II Revised RCRA Facility Assessment of the Monsanto Company; Nitro, West Virginia" dated December 4, 1986, prepared for the USEPA by A.T. Kearney, Inc. (RFA Report). Subsequent to the RFA Report, the specific requirements of the facility Permit were developed through discussions between the USEPA and Monsanto.

The RFA Report and facility Permit identify ground water as the principal environmental medium to be investigated. As described in the RFA report, discrimination of specific potential sources for the ground-water impact was not possible. The environmental and hydrogeologic setting of the site, combined with the history of operations and the nature and proximity of the SWMUs, warranted development of general Study Areas. The RFI Work Plan categorized the SWMUs into two Study Areas: The Process Area and the Waste Treatment Area.

Since previous investigations indicate ground water is impacted at concentrations above Permit-specified levels, ground-water investigations were specified in the Permit for all but one of the SWMUs, whereas investigations of other environmental media (soil, sediment, and surface water) were specified for only three of the 14 SWMUs.

One of these SWMUs, the Building 46 Incinerator was initially investigated as part of a Verification Investigation (VI). The results of the VI are presented in the report titled "Revised Final Verification Investigation Report, Building 46 Incinerator" prepared by Roux Associates, Inc., dated August 24, 1993. This report contains additional information on the unit. In the VI, several constituents were detected in soils above Practical Quantitation Limits (PQLs), but below the Permit-specified, health-based levels. The unit has been incorporated into the RFI to obtain additional information on potential releases in the vicinity of the feed lines for the unit.

Another SWMU, the Facility Sewer System, was segregated from the investigative process by proceeding directly with an individual stabilization measures evaluation program. Roux Associates, Inc.'s work plan titled "Facility Sewer System Stabilization Work Plan Evaluation Study", dated August 5, 1994, details tasks associated with the stabilization program and was subsequently approved by the USEPA. This evaluation is currently in progress, and results of potential stabilization measures will be summarized in a separate document to the USEPA due May 30, 1995.

The appropriate investigative elements for the remaining SWMUs were identified in the facility's "RFI Work Plan", dated April 7, 1994, which was also prepared by Roux Associates, Inc. The RFI Work Plan was approved by the USEPA on May 5, 1994. Specifically, the objectives of the RFI were to:

- characterize the nature, extent, concentration, and migration of hazardous constituents released from SWMUs into ground water and surface water;
- identify actual or potential receptors;
- provide a detailed geologic and hydrogeologic characterization of the area surrounding the SWMUs; and
- determine the need for and scope of corrective measures.

The RFI was implemented by the facility in accordance with the approved Work Plan. This report which comprises two volumes represents a comprehensive summary of the investigation and is organized as follows. A site description which includes individual SWMU's is provided in Section 2.0. A description of the physical setting, including topography, geologic, and hydrogeologic characteristics is provided in Section 3.0. A description of the RFI Work Plan implementation, including deviations and modifications from the Work Plan, is provided in Section 4.0. A technical review of data generated by the RFI and a summary of overall data quality is included in Section 5.0. Sections 6.0 and 7.0 provide an overview and detailed summary, respectively, of the results of the RFI investigation. Section 8.0 presents an evaluation of potential stabilization/corrective measures and a work plan to collect supporting data, and Section 9.0 describes the facility's significant waste minimization projects. These report sections and supporting tables, figures, plates and appendices comprise Volume I of II. Laboratory reports containing analytical data collected during the RFI is contained in Attachment A which is Volume II of II.

2.0 SITE DESCRIPTION

This section presents a description of the site, surrounding land use, plant history, Wastewater Treatment Plant and associated discharge Permit, and individual SWMUs.

2.1 Location and Surrounding Land Use

The Monsanto Nitro Plant is located on the east bank of the Kanawha River, approximately one-half mile north of the City of Nitro in Putnam County, West Virginia. A site location map from the United States Geological Survey (USGS) 7½ minute topographic quadrangle (Saint Albans) is included as Figure 1.

The facility comprises approximately 116 acres and is divided into two study areas: a northern area (approximately 46 acres) designated the Waste Treatment Area, and a southern area (approximately 70 acres) designated the Process Area. Approximately 60 percent of the site is currently covered by production areas, warehouse buildings, parking, or open storage.

As shown on Figure 1, Interstate Highway 64 divides the facility, separating the Waste Treatment Area from the Process Area. The facility is bordered to the east and northeast by commercial properties on State Route 25. These commercial properties consist of a mobile home dealership, an electrical contracting warehouse, and a trucking maintenance yard. The site is bounded to the south by industrial property currently owned and operated by FMC Corporation. The Kanawha River borders the property to the west and northwest.

2.2 Plant History

In 1929, Monsanto acquired the Rubber Services Company, which manufactured chloride, phosphate, and phenol compounds at the facility. Flotation agents, pickling inhibitors, anti-oxidants, anti-skinning, wetting agents, and oils were added to the existing production operations in the early 1930s. Monsanto continued to expand operations at the Nitro facility and accelerated its growth in the 1940s.

The manufacture of rubber chemicals was initially the majority of the Nitro Plant's operations, accounting for about 65 percent of its business. The Nitro Plant has diversified over the years and now produces an animal nutrition chemical in addition to rubber chemicals. Some of the end uses of these chemicals include vulcanization accelerators, a vulcanization inhibitor for the rubber industry, and antioxidants for miscellaneous rubber products and general animal feed. A variety of chemical raw materials have been used including inorganic compounds, organic solvents, and other organic compounds.

As of May 1, 1995, operation of the Nitro facility and management of the entire site and substantially all of its assets (except the improved real estate and certain limited manufacturing assets) were transferred to FLEXSYS America, LP (FLEXSYS), a limited partnership. The Permit is undergoing Class I modification to reflect the change in permittee status from Monsanto to both Monsanto and FLEXSYS. Appropriate notifications and financial assurances are currently being finalized by Monsanto and FLEXSYS.

2.3 Wastewater Treatment Plant

Wastewater treatment is accomplished on site via pretreatment in the Process Area and final treatment in the WTP. The WTP handles all wastewater carried by the Facility Sewer System including process wastewater, sanitary wastewater, and storm-water runoff. The WTP consists of the Activated Sludge Basin, Secondary Clarifier and Tertiary Clarifier. The operation of these units is in accordance with the National Pollutant Discharge Elimination System (NPDES) Permit No. WV0000868. A brief overview of the treatment process is presented below.

Lift Station Number 1, the equalization tanks, and the diversion tank, each located in the Process Area, are equipped with pretreatment apparatus. Lift Station Number 1 is equipped with a pH control system consisting of pH analyzers and caustic and acid addition units. The pH control system moderates the pH in the wastewater prior to pumping the wastewater out of Lift Station Number 1. Additionally, Lift Station Number 1 is equipped with an oil collection system. Collected oil is removed by tanker trucks and properly disposed.

Wastewater is pumped to the equalization tanks. Each equalization tank is equipped with a mixer which provides more uniform consistency of wastewater flowing to the WTP. Wastewater is pumped to the diversion tank if total organic carbon (TOC) analyzers in Lift Station Number 1 register high organic loading. The diversion tank is equipped with three mixers. The mixers provide thorough mixing of more concentrated wastewater with less concentrated wastewater. This operation assists in leveling loading rates to the WTP.

The WTP provides the principal and final treatment of facility wastewater. The WTP is located in the Waste Treatment Area and consists of activated sludge treatment followed by clarification. The corrosivity of wastewater flowing into the activated sludge unit is moderated by a pH control system similar to that described for Lift Station Number 1. The activated sludge unit consists of one basin with associated pumps, liquor addition units, mixers, blowers, and aerators. The clarifiers consist of the clarifier unit and associated pumps, rakes, and anti-foam agents. Treated water is then discharged to the Kanawha River via permitted Outfall No. 001. Sludge produced from the treatment process is thickened, then removed by tanker trucks for on-site disposal by incineration in a facility boiler.

2.4 Description of SWMUs

As previously described, the environmental and hydrogeological setting of the site, combined with the history of operations and the nature and proximity of the SWMUs, warranted the development of two Study Areas: the Process Area and the Waste Treatment Area. The demarcation of these Study Areas was approved in the RFI Work Plan and is shown on Plate 1.

SWMUs in the Process Area include the Facility Sewer System, Equalization Tanks, Past Disposal Area, Niran Residue Pits, Tepee Incinerator, and Building 46 Incinerator. Those in the Waste Treatment Area include the Wastewater Treatment Plant, Emergency Basin, Surge Basin, Equalization Basin, Limestone Bed, Waste Pond, Decontaminated 2,4,5-T Building, and City of Nitro Dump.

Descriptions of each SWMU are provided in the RFA Report and also the Fact Sheet prepared for the facility Permit. The above-referenced documents contain descriptions of start-up dates, closure dates, wastes managed, release controls, and information on potential releases. A brief description of each SWMU and its current condition is presented below. The locations of the individual SWMUs in the Process Area and the Waste Treatment Area are shown on Plate 1.

Process Area SWMUs

Past Disposal Area

This unit occupied part of a triangular piece of land covering approximately 5.7 acres in the northern part of the Process Area adjacent to the Kanawha River. The unit contained the Tepee Incinerator and the Niran Residue Pits which are also designated as SWMUs. The area was closed in 1985 as part of a Consent Agreement with USEPA Region III (III-85-17-DC). The area was regraded and covered with gravel.

Currently, the area is an open gravel-covered area, and part of the area is used for storage of parts and machinery. Surface water runoff is directed to a drainage swale on the eastern edge of the unit. Surface water is present in the drainage swale at certain times depending on precipitation, and sediment accumulates to a limited degree in the drainage swale. Surface water is also present in the water-filled depression shown on Plate 1. The water-filled depression is located in the central part of the Past Disposal Area and contains standing water. The depression is associated with the concrete foundation of a former structure. Ground-water, surface-water, sediment, and riverbank soil sampling were conducted in this area to determine if releases had occurred. Figure 2 provides the sampling locations.

Tepee Incinerator

The Tepee Incinerator was located near the Kanawha River within the boundaries of the Past Disposal Area. The unit was operated from about 1958 to 1962, but its exact location and dimensions are unknown. The unit was used to burn plant trash and rubbish, and has since been demolished. No records were kept as to the precise nature or quantity of the material disposed at the unit. Waste materials containing hazardous constituents are not known to have been burned in the incinerator. The area is currently a gravel-covered field. Sampling in this SWMU was performed as a component of the overall Past Disposal Area SWMU sampling activities described above.

Niran Residue Pits

These units were located along the Kanawha River in the Past Disposal Area. This area is presently an open, gravel-covered field. The units are no longer in existence, and the exact dates of operation are unknown. No records were kept as to the nature and quantities of hazardous materials disposed in this area. Niran was formerly used as a broad spectrum insecticide. Compounds used in the production of Niran include 2,4,5-trichlorophenol. Hazardous compounds formed during the degradation of Niran include 2,4,5-trichlorophenol and p-nitrophenol. Sampling in this SWMU was performed as a component of the overall Past Disposal Area SWMU sampling activities described above.

Aboveground Equalization/Storm-Water Surge Tanks

This unit was constructed in 1990, and consists of four equally-sized 82-foot diameter steel tanks with a combined capacity of 4.8 million gallons. The tanks are used for storage of water, and provide a means to equalize flow and meter water into the facility's wastewater treatment system. Wastewater and storm water are pumped from a lift station into the tanks, from which the fluid flows by gravity to the Wastewater Treatment Plant. The tanks have a synthetic liner beneath the tank bottom with leak detection capability. Ground-water sampling for this SWMU was performed as a component of the Process Study Area sampling activities.

Facility Sewer System

The Facility Sewer System has been in operation since the plant began production around 1918. This unit drains process wastes, sanitary wastes, steam condensate, and storm-water runoff from the facility. The Facility Sewer System contains an extensive network of piping, the total length of which is estimated to be greater than 6,000 feet. The materials of construction of various segments consist of tile piping, epoxy-lined piping, cast iron piping, fiber-reinforced polyester piping, and vitrified clay piping. The system also contains lift stations and pump stations to transfer wastewater to the Wastewater Treatment Plant. Over the years of plant operations, various portions of the piping have been repaired or replaced as necessary. RFI investigations of the Facility Sewer System consisted of ground-water sampling activities. A separate Sewer Stabilization Measures Evaluation Program is concurrently being conducted for this SWMU by the facility.

Building 46 Incinerator

This unit was formerly used to incinerate hazardous wastes generated at the plant. It is located in the Process Area and is currently used for burning Santoquin residue, a nonhazardous waste. Hazardous wastes previously incinerated at the unit included acrolein, hydrocyanic acid tank washings, off-specification product from the Methionine Hydroxy Analog (MHA) acid process, skimmed tall oils, sulphur recovery unit tail gas, laboratory waste solvents, and gas-holder seal oils. It has not accepted hazardous wastes since February 1984. A Verification Investigation was conducted for the unit, the results of which are described in the document titled "Revised Final Verification Investigation Report, Building 46 Incinerator" prepared by Roux Associates, Inc., dated August 24, 1993. In the VI, several constituents were detected in soils above Practical Quantitation Limits, but below the Permit-specified, health-based levels. The unit was incorporated into the RFI to obtain additional information on potential releases in the vicinity of the feed lines for the unit. The area surrounding the Building 46 Incinerator is currently covered with gravel, including the area below the feed lines to the unit. Two soil samples were collected from underneath the Santoquin feed line as part of the RFI. Figure 3 provides the soil sampling locations.

SWMUs in the Waste Treatment Area

City of Nitro Dump

This unit was an operating landfill of slightly less than five acres, approximately 50% of which is located on Monsanto property. The remainder of the unit is on property owned by the State of West Virginia, and was covered by construction of Interstate Highway 64. The unit was in use from about 1929 to 1956. A number of industries and municipalities used the unit to bury waste materials, the precise nature and quantity of which are unknown.

Previous surface soil sampling and analysis by USEPA indicated the presence of dioxin at some locations at the unit. In response, portions of the unit were clay capped and vegetated as part of a Consent Agreement with USEPA (III-86-6-DC). USEPA issued correspondence dated May 5, 1986 indicating approval of the remedial action and compliance with the requirements of the Consent Order. The area is currently a grass-covered field. Ground-water sampling was conducted in this SWMU as a component of the Waste Treatment Study Area sampling activities.

Waste Pond

This unit was at one time a part of the wastewater treatment facility. The unit was a 0.5 acre surface impoundment with the capacity to store approximately one million gallons of wastewater and sludge prior to treatment in the facility treatment plant. The pond was dug into the native soil and is not known to have been lined or covered. This unit began operation in 1973 and was closed in 1980 when it was clay-capped and vegetated. The area is currently a grass-covered field. Ground-water sampling was conducted in this SWMU as a component of the Waste Treatment Study Area sampling activities.

Decontaminated 2,4,5-T Building

This unit was associated with production or storage of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), a herbicide in which the compound 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) is sometimes found as a trace impurity. This building was decontaminated, demolished, and buried in 1970 near the site of the Control Room for the Wastewater Treatment Plant. Ground-water sampling was conducted in this SWMU as a component of the Waste Treatment Study Area sampling activities.

Surge Basin

This unit was at one time a part of the wastewater treatment facility. The unit is 360 feet long, 85 feet wide and has a capacity of 5 million gallons. The Surge Basin is lined with clay and began operations in 1963. The Surge Basin was used for storage of storm-water overflow mixed with wastewater during times of peak flow. The wastewater was considered a hazardous waste until 1986, since at times it received wastewater which had the potential to exhibit the characteristic of corrosivity (i.e., pH greater than 12.5).

The Surge Basin was closed in 1986 following a RCRA Closure Plan. As part of closure, sampling was conducted at the bottom of the basin and indicated corrosive material was not present. The Surge Basin continued to be used as a part of the wastewater treatment facility as a non-RCRA, NPDES-permitted unit until 1990.

Currently, the Surge Basin remains an open basin but is not in use. The basin collects rainfall and contains residual sludge. Ground-water sampling was conducted in this SWMU as a component of the Waste Treatment Study Area sampling activities.

Equalization Basin

This unit was at one time a part of the wastewater treatment facility. The unit was 540 feet long, and 137 feet wide with a capacity of 5 million gallons, and was lined with asphalt. This unit was located directly adjacent to the Emergency Basin and received a slow feed of wastewater from the Emergency Basin. The waste stream was considered hazardous due to corrosivity until 1986.

The Equalization Basin was closed in 1986 under a RCRA Closure Plan. The closure included sampling of bottom material which indicated corrosive material was not present (i.e., pH less than 12.5). The Equalization Basin continued to be used as a part of the wastewater treatment facility as a non-RCRA, NPDES-permitted unit until 1989. Residual sludges in the Equalization Basin were subsequently stabilized in 1989 to 1990. The stabilization included addition of a cement-based stabilizing agent. The area was then soil-capped and revegetated. The area is currently a topographically raised area which supports vegetation. Ground-water sampling was conducted in this SWMU as a component of the Waste Treatment Study Area sampling activities.

Limestone Bed

The Limestone Bed began operation in 1977. This asphalt-lined unit received wastewater for pH adjustment. This unit was part of the wastewater treatment facility and in December 1986 was closed and taken out of service. As part of closure, liquids and sludges were removed by pumping and treated at the Wastewater Treatment Plant. Approximately 3,000 cubic yards of soil, sediment, and asphalt liner were then excavated. The area was backfilled with clean fill and gravel. The area is now an open gravel-covered field. Ground-water sampling was conducted in this SWMU as a component of the Waste Treatment Study Area sampling activities.

Emergency Basin

This unit was part of the wastewater treatment facility and in October 1986 was closed under a RCRA Closure Plan. This unit received wastewater until 1986 that exhibited the characteristic of corrosivity (i.e., pH greater than 12.5), thereby making it a hazardous waste. The unit began operation in 1963 and was lined with asphalt. The unit was approximately 385 feet long and 395 feet wide and had a capacity of approximately 10 millon gallons. The Emergency Basin continued to be used as a part of the wastewater treatment facility until 1990. In 1990 sludges within the Emergency Basin were stabilized/solidified using a flyash and cement-based stabilizing agent. The Emergency Basin was then capped and vegetated. The area mounded due to the volume of stabilizing agent added during closure. The area is currently a topographically raised area which supports vegetation. Ground-water sampling was conducted in this SWMU as a component of the Waste Treatment Study Area sampling activities.

Wastewater Treatment Plant

The WTP handles all wastewater carried by the Facility Sewer System including process wastewater, sanitary wastewater, and storm-water runoff. The WTP consists of the Activated Sludge Basin, a Secondary Clarifier, and a Tertiary Clarifier. These units are fully described in the facility's 1990 NPDES permit application. Ground-water sampling was conducted in this SWMU as a component of the Waste Treatment Study Area sampling activities.

3.0 PHYSICAL SETTING

The following descriptions of the site's physical setting are based on published maps and reports and on information obtained from the RFI as described later in this report.

3.1 Topography

The site is located within the Allegheny Plateau physiographic province in the southwestern part of the state of West Virginia. The topography in the area surrounding the site is typical of the hills and valleys of the maturely dissected Allegheny Plateau. The Kanawha River and its tributaries form an intricate dendritic drainage pattern, and the area contains numerous deep-sided valleys separated by narrow ridges. Topographic relief in the area is several hundred feet, and only a relatively small portion of the land area is flat. Hilltops within several miles of the site rise to elevations of approximately 1,200 feet above sea level. The lowest elevations in the area are along the Kanawha River at about 560 feet above sea level.

Flat land occurs mainly along stream valleys where it forms alluvial terraces, or flood plains. A prominent alluvial terrace has been developed along the Kanawha River which extends from upstream of the City of Charleston a distance of over seventy miles downstream to the confluence of the Kanawha River with the Ohio River. The alluvial terrace consists of relatively flat land bordering the river and averages about 4,000 feet in width in the vicinity of the site. The surface elevation of the alluvial terraces decreases downstream from an elevation of approximately 600 feet at Charleston to approximately 580 feet at Nitro. The Kanawha River has incised into the alluvial terrace and meanders back and forth between the valley walls. The level of the Kanawha River is typically 20 to 30 feet below the level of the surface of the alluvial terrace.

The site is situated on top of the alluvial terrace, and its topography is relatively flat with total relief of less than 10 feet except along the riverbank. The riverbank is a steep slope which has a drop in elevation of between 20 and 30 feet along the riverfront. The highest elevations on the site are at the following man-made features: along the riverbank; atop the low flood control levee which parallels the river in the Process Area; and at the closed impoundments in the Waste Treatment Area.

3.2 Surface Water and Drainage

The site is located in the lower part of the Kanawha River Basin. The Kanawha River Basin drains a large area in southern West Virginia and has its headwaters in North Carolina and Virginia.

The Kanawha River flows in a north to north-northeast direction in the vicinity of the site, and forms the site's western and northwestern boundary. The Kanawha River is used for barge transportation, and river levels are controlled by a series of dams and locks. The normal pool elevation in the vicinity of the site is approximately 560 feet above sea level. Based on published reports, the average volume of flow in the Kanawha River at Charleston is approximately 14,000 cubic feet per second or approximately 9,000 million gallons per day.

Major tributaries of the Kanawha River in the area include Elk River which enters at Charleston, and Pocatalico River which enters approximately 3 miles downstream from the site. Armour Creek, a smaller tributary of the Kanawha River, originates at higher elevations and enters the Kanawha Valley upstream of the site. Upon entering the valley, Armour Creek turns sharply to the north paralleling the Kanawha River, and flows several miles before joining the river one mile north (downstream) of the site. The site is located on the alluvial terrace between the Kanawha River and Armour Creek. Armour Creek is located approximately 2,000 feet east of the site.

The Process Area at the site is largely covered by buildings and asphalt, and surface-water runoff is directed into catch basins and into either the Facility Sewer System or storm-water sewer system. The low levee along the riverbank prevents any overland flow from reaching the Kanawha River. Runoff from manufacturing areas is directed to the Facility Sewer System. Runoff from non-manufacturing areas, such as parking lots and warehouse areas, drains to storm drains which eventually discharge to the Kanawha River.

Only a small portion of the Waste Treatment Area is covered with asphalt, and most of that area is covered with vegetation consisting of grass and shrubby growth. No ditches or subsurface drains are present in this area, and most precipitation directly infiltrates into the soil.

3.3 Geologic Setting

The alluvial terraces along the Kanawha River are underlain by unconsolidated alluvial deposits consisting predominantly of sand, silt and clay with minor gravel. The upper part of the alluvial deposits typically contains fine-grained silt and clay. Coarse sand and gravel are often found in the lower alluvial deposits near the bedrock interface. The alluvial deposits are reported to be laterally variable over short distances due to the lenticular nature of individual beds. Published geologic reports indicate the thickness of the alluvial deposits ranges from 30 to 60 feet in the vicinity of Nitro due to variations in the depth to bedrock.

Bedrock in the immediate vicinity of the site consists of sedimentary rocks of the Conemaugh Group of Pennsylvanian age. This geologic unit contains an interbedded sequence of sandstone, shale and mudstone with thin beds of limestone and coal. The beds are near horizontal or gently inclined, and bedding dips generally less than 5 degrees. Bedrock encountered directly beneath the site is described in drilling logs as gray siltstone. Weathered bedrock encountered in boreholes is described as weathered shale or clay.

Published reports indicate that in many places saline ground water is encountered in consolidated bedrock 100 to 300 feet below the elevation of the major streams. The chloride concentration reportedly increases with depth. At depths of 500 to 1,500 feet, high-density brine containing 100,000 parts per million chloride or more is encountered. Locally, saline water also occurs in shallow aquifers, due to the upward migration of ground water along zones of higher permeability. These conditions are reportedly due to the general upward vertical difference in hydraulic head in the valley bottoms, which causes a regional upward component of ground-water flow in the valleys and an upwelling of salt brines from great depths.

Geologic cross-sections through the site are provided as Figures 4, 5, 6, and 7. The cross sections have been constructed based on logs from boreholes drilled at the site. The Site Plan in Plate 1 provides the locations of the cross sections. As shown in the cross sections, the alluvial deposits extend to a depth of approximately 40 to 50 feet. Fill material is found to a depth of ranging from 2 to 25 feet in many parts of the site. The underlying deposits contain beds of silt and clay, silty sand, and sand. The grain size of the deposits coarsens downward with silt and clay found mostly at the top of the deposits, and medium to coarse sand with gravel more predominant at the bottom of the deposits. The type of sediment encountered varies laterally, and many closely spaced boreholes show sediments which vary considerably. As shown in the cross sections (Figure 4, for example), bedding is lenticular in nature. These findings are consistent with those in published reports.

3.4 Hydrogeologic Characteristics

The alluvial deposits of the Kanawha River Valley contain the uppermost aquifer at the site. The aquifer is unconfined, and the depth to ground water generally varies from 15 to 20 feet below ground surface across the facility. Although considerable variability occurs in sediment type in the alluvial deposits, the ground water within the alluvial deposits is considered to be interconnected and can be characterized as a single aquifer. The "A" wells and "B" wells are considered to monitor the upper and lower part of the same aquifer. A perched ground-water zone was encountered at only one location, WT-15A, where a dense clay bed occurs at about 15 feet below ground surface.

Ground water in the alluvial deposits beneath the facility flows toward the Kanawha River across the entire site. The ground-water elevation contour map (Plate 2) constructed as part of the RFI shows the inferred flow directions. As shown on this figure, a major ground-water divide is present midway between the Kanawha River and Armour Creek. As the divide occurs east of the site boundary, ground-water flow across the facility is towards the Kanawha River in both Study Areas.

Aquifer testing conducted at the site indicates a considerable range in hydraulic conductivity both laterally and vertically in the alluvial deposits. In general, hydraulic conductivity increases with depth in the alluvial deposits. Most hydraulic conductivities measured in the "A" wells in the upper part of the aquifer range from 0.1 to 1 ft/day with values as low as 0.01 ft/day and as high as 24 ft/day. The geometric mean for the "A" wells is 0.51 ft/day. Most hydraulic conductivities measured in the "B" wells in the lower part of the aquifer range from 5 to 10 ft/day with values as low as 2.8 ft/day and as high as 12 ft/day. The geometric mean for the "B" wells is 6.7 ft/day.

Based on the RFI aquifer test results, estimated ground-water flow velocities range from 5 to 60 feet per year based on Darcy's Law and using the following values:

- hydraulic conductivities (k) of 0.51 to 6.7 ft/day using the range for the averages of the "A" and "B" wells;
- an effective porosity (n) of 0.20 as an assumed value based on the soil type; and
- a gradient of 0.005 ft/ft as a typical value from the ground-water elevation contour map.

The volume of ground-water entering the Kanawha River from the alluvial deposits can also be approximated using hydraulic conductivity values obtained from the aquifer tests. The calculated range of values is approximately 3 to 30 gallons per day per linear foot of aquifer along the riverbank. It is important to note the distinction in the relative ground-water flow contribution from the upper and lower alluvial deposits. The upper alluvial deposits, characterized by more fine-grained silts and clays, has on average an order of magnitude lower hydraulic conductivity than the coarser-grained lower alluvial deposits. When the relative thickness of each zone is accounted for, the resulting ground-water flow contribution from the upper deposits represents only 10% to 20% of the ground-water flow contribution from the lower alluvial deposits.

Bedrock-penetrating wells generally have a higher hydraulic head than overburden wells, indicating that the bedrock aquifer has an upward component of flow. Under these conditions, the bedrock aquifer discharges to the overlying alluvial deposits and the Kanawha River.

There are no known potable supply wells in the vicinity of the site which draw water from the alluvial or bedrock aquifers. Water supplies in the region are derived from surface waters; however, there are no potable intakes along the Kanawha River downstream of the site. Potable water for the Nitro plant is purchased from the West Virginia Water Company.

4.0 RFI WORK PLAN IMPLEMENTATION

The RFI Work Plan specified the following activities to be performed:

- collection of soil samples at the Building 46 Incinerator;
- collection of riverbank soil samples along the bank of the Kanawha River;
- collection of sediment samples from the Past Disposal Area;
- collection of surface water samples from the Past Disposal Area;
- installation of monitoring wells at the facility;
- collection of ground-water samples from selected monitoring wells; and
- performance of aquifer tests.

The following subsections provide brief descriptions of the number and type of samples collected in the various areas for each of the environmental media (soil, sediment, surface water, and ground water). Modifications and deviations from the RFI Work Plan are also described in the following subsections. Analytical results are described later in Sections 6.0 and 7.0.

4.1 Building 46 Incinerator Soil Sampling

As specified in the Work Plan, two additional soil samples were collected at the Building 46 Incinerator. A number of soil samples were collected previously as part of the VI at this SWMU. The VI Report recommended the collection of soil samples for additional delineation of this area. Figure 3 shows the soil sampling locations.

The soil samples were collected from underneath the Santoquin feed line at the Building 46 Incinerator on August 25, 1994. The samples were collected in accordance with sampling procedures outlined in the RFI Work Plan. The soil samples, designated 10S and 10D, were collected from a single soil boring at depths of 1.9 and 3.9 feet below ground surface (BGS), respectively. An additional sample (designated 10M), was collected with sample 10D as a blind duplicate.

The samples were analyzed for volatile organic compounds (VOCs), BN/AE compounds, and metals using analytical methods described in Section 8.9 of the RFI Work Plan.

No modifications or deviations to the Work Plan were required. Analytical results for the Building 46 Incinerator soil sampling are discussed in Sections 6.1 and 7.1.

4.2 Riverbank Soil Sampling

The RFI Work Plan specified that soil samples were to be collected at three locations along the Kanawha River to investigate any possible impact by the Past Disposal Area, Tepee Incinerator, and the Niran Residue Pits. The three soil samples were collected on August 24, 1994. Plate 1 shows the locations of the riverbank samples. The samples (designated RB-1, RB-2, and RB-3) were collected at equidistant locations along the riverbank adjacent to the former Past Disposal Area and the Niran Residue Pits, at varying depths. The Work Plan specified that the samples be collected approximately 3 feet above the Kanawha River water level at a depth of approximately 2.5 to 3 feet BGS. The following modifications to these specifications were required. Sample RB-1 was collected at a depth of 2.5 feet BGS, approximately 0.5 feet above the river water level. The slope of the riverbank at sample location RB-2 was too steep to access; therefore, sample RB-2 was collected approximately 12 feet above the water level, at a depth of 2.5 feet BGS. Sample RB-3 was collected approximately 5 feet above the water level, at a depth of 2.5 feet BGS.

The samples were analyzed for VOCs, BN/AE compounds, and metals, in accordance with the RFI Work Plan. The results are discussed in Sections 6.1 and 7.2.

4.3 Sediment Sampling

The sediment investigation, conducted in the Process Area, was designed to screen surface sediments for impact from two SWMUs in the Past Disposal Area: the Tepee Incinerator and the Niran Residue Pits. The samples were collected from the drainage swale adjacent to the Past Disposal Area.

Three sediment samples, designated SED-1, SED-2, and SED-3, were collected on August 25, 1994. Plate 1 provides the locations of the sediment samples. The samples were collected from surficial sediments no deeper than 6 inches, and were analyzed for VOCs, BN/AE compounds, and metals in accordance with the RFI Work Plan. A fourth sample, designated SED-4, was collected with the SED-1 sample as a blind duplicate sample.

The sediment sampling analytical results are discussed in Sections 6.2 and 7.3.

4.4 Surface-Water Sampling

On site surface-water samples were collected at four locations in the Process Area in the vicinity of the Past Disposal Area where standing water is occasionally observed. The samples were required for the Past Disposal Area, Tepee Incinerator, and the Niran Residue Pits. Two samples each were collected from the drainage swale and the water-filled depression as shown on Figure 2. Samples SW-1 and SW-2 were collected from the water-filled depression on September 24, 1994. Samples SW-3 and SW-4 were collected from the drainage swale on December 13, 1994. The samples were analyzed for VOCs, BN/AE compounds, metals, total organic carbon (TOC), total organic halogens (TOX), and pH.

The surface water sampling analytical results are discussed in Sections 6.3 and 7.4.

4.5 Monitoring Well Installation

Prior to implementation of the RFI, 59 monitoring wells existed at the facility which were installed as part of previous investigations conducted since 1985. The existing wells are primarily designated "A", "B", and "C". These designations indicate which horizon the wells are screened in. The "A" wells are screened in the upper part of the alluvial aquifer. The "B" wells are screened in the lower part of the alluvial aquifer. Wells designated "C" are bedrock wells. Well logs for the wells installed as part of the previous investigations are included in Appendix A.

As part of the RFI Work Plan implementation, six additional monitoring wells were installed at the facility between August 23 and 29, 1994. Monitoring wells MW-23A, MW-24A, and MW-22R were installed in the Process Area to provide additional coverage along the Kanawha River. MW-22R was installed to replace monitoring well MW-22A. Plate 1 shows the locations of the monitoring wells.

Monitoring wells WT-13A, WT-14A, and WT-15A were installed in the Waste Treatment Area, upgradient and downgradient of the City of Nitro Dump. These wells were installed to evaluate ground-water quality in the vicinity of the former dump. A fourth well, WT-12A, was initially planned to be installed upgradient of the City of Nitro Dump, adjacent to Interstate Highway I-64, but the presence of subsurface utilities precluded well installation. A modification waiving the WT-12A installation requirement was approved by USEPA in correspondence dated September 30, 1994.

Well Construction Forms for each monitoring well are contained in Appendix B. Geologic Logs for each well are provided in Appendix A.

4.6 Aquifer Test Well Installation

Additional test wells were installed for aquifer testing purposes. Wells TW-1, PZ-1, and PZ-2 were installed approximately 50 feet from existing wells MW-4A and MW-4B to conduct aquifer testing. A modification to the RFI Work Plan was that wells TW-2, PZ-3, and PZ-4 were installed approximately 50 feet from existing wells WT-5A and WT-5B for aquifer testing purposes instead of in the vicinity of well WT-7A as initially planned. This modification was approved by USEPA in correspondence dated September 12, 1994.

The borings for wells TW-1 and TW-2 were augered until refusal was encountered at depths between 40 and 45 feet. These depths were shallower than most other wells at the site where bedrock was encountered at a general depth of 50 to 55 feet. This resulted in these wells being installed mostly in the upper part of the alluvial aquifer at an interval similar to that of the "A" monitoring wells. The effect of these intake intervals on well yields is further described in Section 7.5.

Well Construction Forms for each monitoring well are contained in Appendix B. Geologic Logs for each well are provided in Appendix A.

4.7 Ground-Water Sampling

Prior to sampling, depth to ground-water measurements were collected from the facility's monitoring well network on September 20, 1994 in accordance with the procedures contained in the RFI Work Plan. Top-of-casing elevations for the facility's monitoring wells, including the newly installed wells, were surveyed during the week of September 20, 1994. The survey was performed by Terradon, Inc. located in Nitro, West Virginia. The survey was performed to provide a consistent datum for the Process Area, Waste Treatment Area, and the off-site wells. The measured ground-water elevations were used to construct ground-water elevation contour maps. Table 1 contains a summary of monitoring well information including ground-water elevations, vertical top-of-casing elevations, and state plane coordinate locations.

The facility's monitoring well network was sampled between September 19 and September 24, 1994. The following wells were sampled: MW-1A, MW-1B, MW-2A, MW-2B, MW-3A, MW-3B, MW-4A, MW-4B, MW-5A, MW-5B, MW-6A, MW-6B, MW-7, MW-8, MW-11A, MW-11B, MW-14, MW-15, MW-17A, MW-17B, MW-18A, MW-18B, MW-19A, MW-19B, MW-20A, MW-20B, MW-21A, MW-21B, MW-22R, MW-23A, MW-24A, WT-1, WT-2, WT-3, WT-4A, WT-4B, WT-5A, WT-5B, WT-6, WT-7A, WT-7B, WT-7C, WT-8A, WT-8B, WT-8C, WT-9A, WT-9B, WT-9C, WT-10A, WT-10B, WT-10C, WT-11A, WT-11B, and WT-11C. These samples were analyzed for VOCs, BN/AE compounds, metals, TOC, TOX, and pH. Monitoring wells TD-1, TD-3, TD-5, TB-1, TB-3, WT-13A, WT-14A, and WT-15A were sampled and analyzed for the same parameters identified previously and for dioxin and dibenzofuran compounds.

Ground-water sampling was conducted in accordance with the procedures described in Section 7.2.3 of the RFI Work Plan with variations from these procedures as described below.

The RFI Work Plan specified use of a submersible pump; however, due to equipment problems in maintaining constant purge rates, a variance from the purging procedures was requested from the USEPA. Approval for hand-bailing was granted by USEPA in correspondence dated October 12, 1994. Approximately 20 wells were purged by hand-bailing. Other modifications included: holding samples overnight for shipment the following day, and re-sampling of WT-11B by Kemron Environmental Services, Inc. due to broken sample bottles during shipment. These modifications were described in correspondence to the USEPA dated September 28, 1994.

Ground-water samples were analyzed by Kemron Environmental Services, Inc., located in Marietta, Ohio. Analytical results for ground-water samples collected in the Process Area are provided in Tables 10, 11, and 12. Analytical results for ground-water samples collected in the

Waste Treatment Area are provided in Tables 13, 14, and 15. Results of ground-water sampling are discussed in Sections 6.4 and 7.6.

4.8 Aquifer Testing

As part of the RFI activities, aquifer testing was conducted to investigate aquifer hydraulic characteristics. Aquifer testing consisted of the performance of two step-drawdown tests, two 24-hour aquifer tests, and twenty-one slug tests. The objective of the tests was to determine the hydraulic conductivity of the underlying aquifer and determine its ability to yield water.

The slug tests were conducted according to the procedures contained in Section 7.2.4.1 of the RFI Work Plan. Slug tests were conducted for the following Process Area monitoring wells: MW-3A, MW-3B, MW-4A, MW-4B, MW-5A, MW-5B, MW-6A, MW-6B, MW-10, MW-21A, MW-21B, MW-22R, and TW-1. Slug tests were also conducted on the following Waste Treatment Area wells: WT-3, WT-5A, WT-5B, WT-7A, WT-7B, WT-13A, TD-5, and TW-2. Slug tests were scheduled for wells MW-7 and WT-14A; however, the presence of high levels of organic compounds and/or separate-phase product prevented the performance of slug testing. Water-level measurements were collected during testing using automated pressure transducer devices. The data were subsequently downloaded to a personal computer for analysis using the method of Bouwer and Rice as provided in the computer program AQTESOLV®.

Step-drawdown testing was conducted on test wells TW-1 and TW-2 prior to conducting the 24-hour aquifer tests. The step-drawdown testing was performed to determine sustainable yields of the test wells. The originally proposed pumping rates for the tests were 2, 4, and 6 gallons per minute (gpm); however, achievable pumping rates were found to be much lower than initially anticipated.

Two 24-hour aquifer tests were conducted between September 15 and September 18, 1994 using wells TW-1 and TW-2 as pumping wells. A modification to the RFI Work Plan consisted of moving the location of TW-2 to approximately 50 feet from WT-5A. Due to the very low average pumping rates (0.04 gpm for TW-1 and 0.15 gpm for TW-2), a stable pumping rate for the 24-hour tests could not be maintained. For the TW-2 test, the flow rate varied between 0.13 and 0.20 gpm. For the TW-1 test, flow rates varied between 0.02 and 0.04 gpm.

The results of the aquifer testing are discussed in Section 7.5. The aquifer test results are provided in Appendix C.

5.0 EVALUATION OF ANALYTICAL DATA QUALITY

Roux Associates, Inc. reviewed the analytical data in accordance with procedures specified in the approved RFI Work Plan's Quality Assurance Project Plan (QAPP). The review included the evaluation of holding times, blank results, field duplicate analysis, surrogate standard recovery rates, and method detection limits (MDL). Additionally split-sampling results were evaluated. The overall data quality is considered acceptable. Although some problems were encountered in analysis of the samples, none impacted the data usability for purposes of evaluating the results of the RFI. Data quality issues included blank contamination, low surrogate recoveries due to matrix interference, and differences in duplicate analyses. A brief overview of the evaluation is presented below. A detailed evaluation is presented in Appendix D and Appendix E contains the West Virginia Department of Natural Resources Compliance Monitoring Evaluation Report.

Only two compounds were found in blank samples, 2-butanone (MEK) and zinc. Since MEK was not detected in corresponding field samples, the data was not qualified. Zinc results were qualified for select samples as described in Appendix D.

Duplicate soil and ground-water sample results showed a variability in concentrations as indicated in the calculated relative percent differences (RPDs) as shown in Table 2. Split sampling was also performed for VOCs on five monitoring wells and Table 3 presents comparison of analytical results. These results are considered acceptable, particularly considering the variability common in field duplicates and split samples.

Surrogate recovery rates were outside acceptable limits in a number of samples. Samples with surrogate rates outside of acceptable limits were reanalyzed by the laboratory. If surrogate recovery rates remained outside the acceptable limits, the data was qualified as described in Appendix D. Out of range surrogate recovery rates are commonly encountered during the analysis of ground-water samples and are believed to be the result of matrix interference.

The review of laboratory procedures indicate that each laboratory consistently followed the established guidelines for sample analysis. As such, no sample data was qualified based on laboratory procedures. Since the laboratory adhered to applicable analytical procedures; all samples were analyzed within the required holding times; surrogate recovery rates which affected a number of samples were properly qualified; and samples affected by suspected blank contamination is inconsequential; the laboratory data quality is deemed acceptable.

6.0 OVERVIEW OF RFI ANALYTICAL RESULTS

The following sections provide an overview of the RFI analytical results for soils, sediments, surface water and ground water. The analytical results are compared to the levels contained in Lists 1 through 4 of the facility Permit, hereafter referred to as "Permit-specified levels."

A more detailed comparison of individual analytes to Permit-specified levels is provided in Section 7.0. Tables 5 through 7 summarize the soil sample analytical data; Tables 8 and 9 present the sediment and surface-water analytical data, respectively; and Tables 10 through 15 summarize the ground-water analytical data.

6.1 Soil Analytical Results

Soil samples were collected from the Building 46 Incinerator SWMU as part of both the Verification Investigation (VI) and RFI process. Additionally, three riverbank soil samples were collected downgradient from three SWMUs: the Tepee Incinerator, Niran Residue Pits, and Past Disposal Area. These soil samples were analyzed for VOCs, BN/AE compounds, and metals. The following is an overview of the results:

- Tetrachloroethene (PCE), which was the only VOC detected in soil above Permit-specified levels in the VI of the Building 46 Incinerator, was not detected in the RFI soil samples. As no other VOCs were detected in soil samples above Permit-specified levels, no stabilization/corrective measures for VOCs in soils are currently proposed.

- A total of five individual BN/AE compounds were detected above Permit-specified levels in the VI of Building 46 Incinerator. These same five compounds, and one additional BN constituent, were also detected in one or more of the riverbank samples. All six of these BN/AE compounds are high molecular weight polynuclear (polycyclic) aromatic hydrocarbons (PAHs) and are relatively immobile and exhibit low solubility in water. PAHs are ubiquitous in the environment resulting from combustion of heating fuels and naturally-occurring materials such as grasses and other vegetation. The range of concentrations of PAHs reported in background urban soils is illustrated in the following table:

PAH	Range of Concentrations in RFI Soil Samples ($\mu g/kg$)	Typical Urban Soil Concentrations ($\mu g/kg$)[1]
Benzo(a)anthracene	180 - 600	169 - 59,000
Benzo(a)pyrene	40 - 800	165 - 220
Benzo(b)fluoranthene	50 - 1,200	15,000 - 62,000
Ideno(1,2,3-c,d) pyrene	ND - 180	8,000 - 61,000
Chrysene	200 - 600	251 - 640
Phenanthrene	320 - 2,000	Data Not Available

[1]Reference: Draft Toxicological Profile for PAHs (ATSDR, 1989).

- Based on this information, the PAHs detected in soils at the facility are typical of concentrations observed in urban soils. The possible exception to this is benzo(a)pyrene, detected in soils in five of the total 20 samples collected in the VI/RFI process and one of the three RFI riverbank samples. The presence of this compound in localized situations is unlikely to represent a significant impact to soils at an industrial facility, and no stabilization/corrective measures for PAHs in soils are currently proposed.

- Only two metals were detected in surface and subsurface soil samples at levels above those specified in the Permit: arsenic and beryllium. Both arsenic and beryllium are found naturally in soils with typical background concentrations in soils ranging from 0.1 to 73 milligrams per kilogram (mg/kg), and <1 to 7 mg/kg, respectively (USGS, 1984). Arsenic was detected in soil samples ranging from 0.6 mg/kg to 8.6 mg/kg. Beryllium was reported in concentrations ranging from not detected to 1.2 mg/kg. Given that the low level detections are consistent with typical background conditions, no stabilization/corrective measures for metals in soils are currently proposed.

6.2 Sediment Analytical Results

Sediment samples were collected and analyzed for VOCs, BN/AE compounds, and metals from three locations along the drainage swale within the Past Disposal Area. The following is an overview of results:

- No VOCs were detected in sediment samples above Permit-specified levels and, as a result, no stabilization/corrective measures for VOCs in sediments are required.

- One BN/AE compound, bis(2-ethylhexyl)phthalate, was detected above Permit-specified levels in one of the four sediment samples. No other BN/AE compounds were detected above Permit-specified levels. Given that the detection was of a relatively low level and limited to one location, no stabilization/corrective measures for BN/AE compounds in sediments are proposed.

- Two metal constituents, arsenic and beryllium, were detected above Permit-specified levels in sediment samples. These two compounds represent the same metal constituents detected in other area soil samples and are suspected to be associated with background conditions. As a result, no stabilization/corrective measures for metals in sediments are currently proposed.

6.3 Surface-Water Analytical Results

Surface-water samples were collected and analyzed for VOCs, BN/AE compounds, and metals at four locations within the Past Disposal Area. The results of the surface-water sampling are as follow:

- No exceedances of any Permit-specified levels was found for any VOC, BN/AE compound, or metal constituent. Based on the results of this sampling, no stabilization/corrective measure for surface water in the Past Disposal Area is warranted.

6.4 Ground-Water Analytical Results

Ground-water samples were collected and analyzed for VOCs, BN/AE compounds and metals in all locations and for PCDD and PCDF in select wells. The results of the ground-water sampling are as follow:

- No constituents were detected at concentrations above Permit-specified levels in any bedrock wells. As no constituents exceeded permit-specified levels, no stabilization/corrective measures are proposed for bedrock series wells.

- No detections of PCDD or PCDF compounds were found in any ground-water sample collected, and no stabilization/corrective measures are required.

- While there are several locations where metals constituents are detected in ground water above Permit-specified levels, the low frequency of detections and observed concentrations suggest that no stabilization/corrective measures for metals in ground-water are currently proposed.

- Of the BN/AE compounds, only those associated with the chlorinated phenol group were detected above Permit-specified levels. However, these detections are isolated to only two of the 62 wells sampled, MW-24A in the Past Disposal Area, and WT-14A in the Waste Treatment Area. The magnitude of the observed concentrations in WT-14A merits consideration of stabilization/corrective measures for chlorinated phenols in this area. As a result, the area proximate to well WT-14A is identified as a primary area of concern as described in Section 6.5 below. Potential stabilization/corrective measures for this area of concern are further discussed in Section 8.0.

- For evaluation of VOC results, use of key indicator compounds is necessary for overview purposes. Key indicator compounds were selected based on the frequency of detection in ground-water samples and magnitude of observed dissolved-phase concentrations. As shown in Table 16, trichloroethene (TCE) and benzene are selected as the key indicator compounds for representation of VOC distribution in ground water. TCE was detected along the western boundary of the Process Area, proximate to the main sewer artery. The observed TCE concentrations are considered stabilized, as its use was completely ceased at the plant in 1991. The magnitude and observed occurrence of benzene and separate-phase product in the Past Disposal Area wells, and benzene detections in WT-14A in the Waste Treatment Area, also merits consideration of potential stabilization/corrective measures in these areas. As a result, these areas are identified as primary areas of concern as described below. Potential stabilization/corrective measures are further discussed in Section 8.0.

6.5 Identification of Primary Areas of Concern

As described above, the assessment of the nature and extent of ground-water impact included evaluation of the horizontal and vertical distribution of the key indicator compounds, benzene, chlorinated phenols and TCE. The individual horizontal distribution maps of these indicator compounds in ground water are depicted on Plates 3, 4, and 5, respectively. Only one compound, TCE, had a sufficient number of detections to facilitate preparation of a vertical distribution map (Plate 6). As is evident by the decreasing number of detections of individual constituents with deeper monitoring well horizons (see Table 16), and the predominant vertically decreasing concentrations for TCE in ground water shown on Plate 6, shallow ground water is the primary concern. This observation is consistent with the hydrogeological findings which indicate that shallow ground water in the upper alluvial deposits moves relatively slowly.

The following approach was used to identify the horizontal extents of the primary areas of concern for ground water. Considering that the ground-water discharges to the Kanawha River, West Virginia surface-water quality regulations were researched to determine if criteria exist for the indicator compounds in Kanawha River. Next, the individual indicator compound distribution maps were combined into one figure. Finally, using a simple volumetric ratio of site ground-water flow to nearbank river flow, a preliminary surface-water impact value was calculated.

The results of this preliminary analysis indicate that areas of the site which have ground-water concentrations of indicator compounds exceeding 1,000 $\mu g/\ell$ should be considered for potential stabilization/corrective measures.

Plate 7, represents the summary of areas exceeding 1,000 $\mu g/\ell$ for indicator compounds. As previously discussed, the plant ceased using TCE in 1991, and stabilization/corrective measures are already being pursued for the process wastewater sewers. This leaves two primary areas of concern to be considered for potential stabilization/corrective measures: Primary Area of Concern #1 (the Past Disposal Area) and Primary Area of Concern #2 (the area proximate to well WT-14A), as shown on Plate 8.

While preliminary, this analysis is sufficient to define areas where stabilization/corrective measures will likely be warranted. Future activities will be developed as necessary to provide supporting evidence of this preliminary analysis of residual areas of concern. Data needs and proposed future activities are further discussed in Section 8.5.

7.0 SUMMARY OF RESULTS BY INDIVIDUAL SWMU

The following sections provide a detailed summary of RFI results for the various media and constituents investigated. The analytical results are compared to the levels contained in Lists 1 through 4 of the facility Permit. The results of the RFI are also summarized in Tables 4 through 15. Table 4 contains the results of aquifer testing. Tables 5 through 9 contain a summary of results for surface water, sediment, and soil sampling. Tables 10 through 15 provides a summary of analytical results for ground-water samples.

7.1 Building 46 Incinerator Soil Sampling

Two samples, designated 10S and 10D, were collected from underneath the Santoquin feed line at depths of 1.9 and 3.9 feet below ground surface (BGS), respectively. The samples were analyzed for VOCs, BN/AE compounds, and metals. Tables 5 and 6 contain the analytical results of the RFI sampling along with data collected from the earlier VI sampling events. As shown in Tables 5 and 6, VOCs were detected below Permit-specified levels in sample 10S, consisting of acetone, toluene, and total xylenes. Concentrations ranged from 0.008 mg/kg of toluene to 0.16 mg/kg of acetone. No VOCs were detected in sample 10D. The only VOC detected above the Permit-specified level was PCE, detected in samples 6S and 6D, collected during the VI. PCE was detected in sample 6S at 0.3 mg/kg and in sample 6D at 1.3 mg/kg. As no other VOCs were detected in soil samples above Permit-specified levels, no stabilization/corrective measures are currently proposed.

Table 6 contains BN/AE compound analytical results for the Building 46 Incinerator soil sampling. BN/AE compounds detected above the Permit-specified levels in sample 10S include benzo (a) anthracene, benzo (b) fluoranthene, benzo (a) pyrene, and chrysene. BN/AE compounds were not reported above the method detection limit for sample 10D. The above-referenced BN compounds and phenanthrene were detected above the Permit-specified levels in samples 1D, 2S, 5S, 5D, and 6S. These samples were collected during the earlier VI activities. The presence of these BN/AE compounds, which are all PAHs, are unlikely to represent a significant impact to soils at an industrial facility and no stabilization/corrective actions are currently proposed.

Several metals were detected in samples 10S and 10D, including arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel and zinc (Table 5). Of these, only arsenic and beryllium were detected above the Permit-specified levels. Beryllium was detected at a concentration of 0.7 mg/kg in 10S and 1.1 mg/kg in 10D. Arsenic was detected at a concentration of 3.5 mg/kg in 10S and 2.7 mg/kg in 10D. As both arsenic and beryllium are naturally occurring compounds, and observed levels are consistent with typical background conditions, no stabilization/corrective measures for metals in soils are currently proposed.

Sample results from the VI investigation and the RFI were combined to evaluate the horizontal and vertical extent of compounds above the Permit-specified levels. Benzo(a)fluoranthene and benzo(a)pyrene were the only BN compounds detected above Permit-specified levels at depths greater than four feet below ground surface. PCE was detected above Permit-specified levels in sample 6S and 6D. Arsenic and beryllium were detected above Permit-specified levels in samples 10S and 10D.

7.2 Riverbank Soil Sampling

Three samples, designated RB-1, RB-2, and RB-3, were collected from the riverbank and were analyzed for VOCs, BN/AE compounds, and metals. Table 7 contains a summary of detected analytes for the riverbank samples.

VOCs reported for samples RB-1, RB-2, and RB-3 include methylene chloride and toluene. No VOCs were detected above the Permit-specified levels in any of the riverbank samples, and no stabilization corrective measures are warranted.

BN/AE compounds detected in sample RB-1 above the Permit-specified levels include benzo (a) anthracene, chrysene, benzo (b) fluoranthene, benzo (a) pyrene, and indeno (1,2,3-cd) pyrene, in concentrations ranging from 0.18 to 0.29 mg/kg. As previously described, these compounds are ubiquitous in heavily industrialized sites. Sample RB-3 contained benzo (a) anthracene, chrysene, and benzo (b) fluoranthene in concentrations exceeding the Permit-specified levels of 0.1, 0.1, and 0.02 mg/kg, respectively. BN/AE compounds were not detected in sample RB-2. The presence of these BN/AE compounds, which are all PAHs, are unlikely to represent a significant impact to soils at an industrial facility and no stabilization/corrective actions are proposed at this time.

Samples RB-1, RB-2 and RB-3 contained arsenic and beryllium in concentrations exceeding the Permit-specified levels. Arsenic was reported in concentrations ranging from 3.4 to 8.6 mg/kg, compared to the Permit-specified level of 0.5 mg/kg. Beryllium was detected in concentrations ranging from 0.9 to 1.1 mg/kg, compared to the Permit-specified level of 0.2 mg/kg. All of the other metals detected were below the Permit-specified levels.

As both arsenic and beryllium are naturally occurring compounds, and observed levels are consistent with typical background conditions, no stabilization/corrective measures for metals in soils are currently proposed.

7.3 Sediment Sampling

Three sediment samples, designated SED-1, SED-2, and SED-3, were collected along the drainage swale adjacent to the Past Disposal Area. The samples were analyzed for VOCs, BN/AE compounds, and metals. Table 8 contains a summary of detected analytes for the sediment samples.

No VOCs were detected in any of the sediment samples. Sample SED-3 was the only sample that reported concentrations of BN/AE compounds. Sample SED-3 contained 0.21 mg/kg of N-nitrosodiphenylamine and 4.40 mg/kg of bis (2-ethylhexyl) phthalate. The reported N-nitrosodiphenylamine concentration did not exceed the Permit-specified level. Bis (2-ethylhexyl) phthalate was detected at a concentration in excess of the Permit-specified level of 1.0 mg/kg. This compound is commonly found as a contaminant introduced in the sampling and analysis process.

Several metals were detected in the sediment samples. Metals found at concentrations exceeding Permit-specified levels include arsenic, ranging from 0.6 to 8.2 mg/kg, and beryllium which was reported at 0.6 mg/kg for SED-3. Arsenic has a Permit-specified level of 0.5 mg/kg and beryllium has a Permit-specified level of 0.2 mg/kg.

Based on the above-described results, no stabilization/corrective measures are proposed for sediments.

7.4 Surface-Water Sampling

Four surface-water samples were collected in the Past Disposal Area as part of the RFI activities. Two samples, designated SW-1 and SW-2, were collected from the water-filled depression (Figure 2). The other two samples, designated SW-3 and SW-4, were collected from the drainage swale adjacent to the Past Disposal Area. Table 9 contains a summary of detected analytes for the surface-water samples.

No VOCs or BN/AE compounds were detected in samples SW-1 and SW-2. The only metals detected were selenium in SW-1 at a concentration of 4 $\mu g/\ell$ and zinc in SW-2 at a concentration of 10 $\mu g/\ell$. Selenium was reported below the Permit-specified levels. Zinc was detected in the field blank.

TOC was detected in surface water samples SW-1 and SW-2, at concentrations of 10 mg/ℓ and 6 mg/ℓ, respectively. TOC was not detected in samples SW-3 and SW-4. TOX was detected in surface water samples at concentrations ranging from 0.02 mg/ℓ to 0.08 mg/ℓ.

Based on the analytical results for surface water, no stabilization/corrective measures are warranted.

7.5 Aquifer Test Results

The slug test results are provided in Table 4. Computer plots of time versus displacement for each slug test are included in Appendix A. These plots were generated using AQTESOLV®. As shown in Table 4, hydraulic conductivity values range from 0.01 to 24 feet per day (ft/d). The lower conductivity values (less than 1 ft/d) are primarily derived from monitoring wells screened in the upper part of the alluvial aquifer, consisting of silt, clays and silty fine to medium sands. The geometric mean for slug test results in the upper portion of the aquifer is 0.51 ft/d. Higher values are obtained from wells screened in the lower part of the alluvial aquifer, consisting of mostly medium to coarse sands. The geometric mean for these slug tests is 6.7 ft/d. The slug tests indicate that wells screened in the upper aquifer yield significantly less water than wells screened in the lower portion of the aquifer. These results are consistent with published results.

The step-drawdown test for TW-2 was conducted on September 15, 1994. The test started with an initial pumping rate of 5 gpm and the well was pumped dry in approximately 2 minutes. After allowing the well to recover, the test was started again with a pumping rate of 0.1 gpm, and finished with a pumping rate of approximately 0.08 gpm. The step drawdown test for TW-1 was conducted on September 17, 1994. Pumping rates were much lower than the initial estimates. Pumping rates for TW-1 were approximately 0.13, 0.10, and 0.50 gpm, respectively. The step-drawdown tests indicated that sustainable yields for the upper portion of the aquifer were less than 0.15 gpm.

The results of the 24-hour aquifer tests were analyzed using AQTESOLV®. Time versus drawdown plots of each pumping well were generated and are provided in Appendix C. The aquifer test results indicate that the upper aquifer zone, composed primarily of silts, clays and silty sands, cannot be pumped at rates exceeding 0.15 gpm.

A precise calculation of hydraulic conductivity and transmissivity values could not be made from the aquifer tests because the extremely low pumping rates generated fluctuations in water levels within the pumping wells and because no appreciable drawdown was observed in the piezometers during each test. However, the following qualitative conclusions can be made from the results of the aquifer tests: sustainable yields for wells screened within the upper portion of the aquifer are less than 1 gpm and the expected radii of influence within the upper aquifer portion will be less than 25 feet.

7.6 Ground-Water Sampling Results

Monitoring wells in the Process Area and Waste Treatment Area were sampled for VOCs, BN/AE compounds, metals, TOC, TOX, and pH. Select monitoring wells in the Waste Treatment Area were also sampled for dioxin and dibenzofuran compounds. A summary of detected analytes for the Process and Waste Treatment Area wells is provided in Tables 10 through 15. The detected analytes have been grouped into the following classes for discussion:

- chlorinated ethanes and ethenes;
- chlorinated methanes;
- non-chlorinated aromatic compounds;
- chlorobenzene;
- ketones;
- miscellaneous volatile and semivolatile organic compounds;
- phthalates;
- phenolic compounds;
- polynuclear aromatic hydrocarbons;
- metals;
- dioxins/dibenzofuran compounds;
- TOC;
- TOX; and
- pH.

The following sections describe each compound grouping and distribution in greater detail.

7.6.1 Chlorinated Ethanes and Ethenes

Tables 10 and 13 provide a summary of detected chlorinated organic compounds. Chlorinated VOCs detected in ground water include 1,1-dichloroethene; trans-1,2-dichloroethene; tetrachloroethene; trichloroethene; cis-1,2-dichloroethene; 1,1-dichloroethane; 1,2-dichloroethane; 1,1,2-trichloroethane; trans-1,2-dichloroethene; cis-1,2-dichloroethene; and vinyl chloride. TCE is the most prevalent and widespread chlorinated VOC found in ground water. Many of the above VOCs, including cis- and trans-1,2-dichloroethene, and vinyl chloride, are breakdown products of TCE.

A distribution map for TCE across the facility is provided as Plate 5. As shown in Plate 5, TCE is present above the Permit-specified level of 5 $\mu g/\ell$ over a large portion of the Process Area, with its greatest concentrations (up to 3,200 $\mu g/\ell$ in MW-20A) along the riverbank in the Process Area. The distribution of TCE is proximate to the facility sewer system. Plate 6 provides a depiction of the vertical distribution of TCE in ground water along the southern and western property boundaries.

TCE concentrations in the Waste Treatment Area ranged from not detected to 610 $\mu g/\ell$. The highest concentrations were reported proximate to the City of Nitro Dump (WT-13A) and the surface impoundments (WT-9A).

7.6.2 Chlorinated Methane Compounds

Chlorinated methane compounds include methylene chloride, chloroform, and carbon tetrachloride. Methylene chloride is reported present sporadically in only a few wells. Chloroform and carbon tetrachloride often are present together. Chloroform is present along the southern boundary of the facility, at concentrations ranging from not detected to 81 $\mu g/\ell$. The Past Disposal Area contains chloroform in concentrations to 37 $\mu g/\ell$.

Chloroform is present in two regions of the Waste Treatment Area: in the vicinity of the former 2,4,5-T Building and the former surface impoundments. Concentrations range from not detected in TD-3 to 41 $\mu g/\ell$ in WT-9A. Wells with concentrations exceeding the Permit-specified level of 6 $\mu g/\ell$ include WT-7B, WT-9A, TB-3, and TD-1.

Based on the observed frequency and magnitude of chloroform detections in ground water, no stabilization/corrective measures are currently proposed.

7.6.3 Non-Chlorinated Aromatic Compounds

Non-chlorinated aromatic compounds analyzed include benzene, toluene, ethylbenzene, and xylenes (BTEX compounds). Of these compounds, benzene is the only one which exceeds Permit-specified levels. A distribution map for benzene is provided as Plate 3. Benzene is present in the vicinity of the Past Disposal Area with concentrations ranging from not detected in MW-19A to 3,000 $\mu g/\ell$ in MW-7.

In the Waste Treatment Area, wells with benzene concentrations exceeding the Permit-specified level of 5 $\mu g/\ell$ are present in the vicinity of the City of Nitro Dump, the 2,4,5-T Building and the former surface impoundments. The highest concentrations of benzene are observed in WT-14A (2,600 $\mu g/\ell$) located downgradient of the former City of Nitro Dump.

The observed frequency and magnitude of aromatic compound detections, especially benzene, merit further stabilization/corrective measures consideration.

7.6.4 Chlorobenzene

Chlorobenzene is present in the Past Disposal Area and at the southwest corner of the Process Area. Chlorobenzene concentrations range from not detected to 47 $\mu g/\ell$ (in MW-24A) in the Past Disposal Area. Chlorobenzene was not detected above the Permit-specified level of 100 $\mu g/\ell$ in any Process Area wells.

Chlorobenzene was found in two areas of the Waste Treatment Area. Chlorobenzene is present in the vicinity of the 2,4,5-T Building and the former surface impoundments. Concentrations of chlorobenzene near the 2,4,5-T Building range from not detected in TB-1 to 990 $\mu g/\ell$ in TD-3. The greatest concentration of chlorobenzene was observed at the former surface impoundments, at a concentration of 1,000 $\mu g/\ell$ in WT-9A.

Based on the observed concentrations of chlorobenzene nearest the river, further stabilization/corrective measures may be proposed for chlorobenzene in ground-water as part of the Primary Area of Concern #2.

7.6.5 Ketones

Acetone was detected sporadically in the Process Area in the southeastern, upgradient portion of the property. Acetone was reported in background wells MW-17A and upgradient in MW-11B in concentrations of 110 $\mu g/\ell$. Acetone is a common sampling and laboratory artifact.

Other ketones, consisting of MEK and 4-methyl-2-pentanone (MIBK) were found in the vicinity of the Niran Residue Pits and the Past Disposal Area. MEK was only detected in MW-11B at 110 $\mu g/\ell$ and MIBK was reported only for MW-6A at 54 $\mu g/\ell$. These results are below the Permit-specified levels for MEK and MIBK of 2,000 $\mu g/\ell$ for each compound.

Ground-water samples from the Waste Treatment Area contained MIBK and acetone, and MEK was not detected in the Waste Treatment Area wells. Acetone was detected near the former City of Nitro Dump at WT-14A and in the former surface impoundments at WT-9A at concentrations of 890 μg/ℓ and 590 μg/ℓ, respectively. MIBK was found in WT-9A at a concentration of 43 μg/ℓ. These concentrations are below the Permit-specified levels for acetone and MIBK of 4,000 and 2,000 μg/ℓ, respectively.

Based on the above-described results, no further stabilization/corrective measures are proposed for these compounds.

7.6.6 Miscellaneous Volatile and Semivolatile Organic Compounds

Carbon disulfide is present along the FMC property boundary in concentrations up to 1,000 μg/ℓ in MW-18B and at the Past Disposal Area at concentrations up to 61 μg/ℓ in MW-22R. Comparison to the Permit-specified levels for carbon disulfide reveals no exceedances. Possible sources for the elevated levels of carbon disulfide in MW-18B is former carbon disulfide storage and use on the adjacent property.

Carbon disulfide was also detected in wells in the vicinity of the secondary clarifier in the Waste Treatment Area, at concentrations ranging from 11 μg/ℓ to 18 μg/ℓ. 1,2-dichloropropane was found only near the former surface impoundments in WT-9A, at a concentration of 10 μg/ℓ. For comparison, the Permit-specified levels for carbon disulfide and 1,2-dichloropropane are 4,000 and 5 μg/ℓ, respectively.

The compounds bis (2-chloroethyl) ether, N-nitrosodi-N-propylamine, and isophorone appear sporadically in the vicinity of the Past Disposal Area, Niran Residue Pits, and in low concentrations along the FMC property boundary. Miscellaneous semivolatile organic compounds detected in the Waste Treatment Area include isophorone and N-nitrosodi-di-N-propylamine. Isophorone was detected in WT-9A at 65 μg/ℓ. N-nitrosodi-di-N-propylamine was detected in WT-14A at a concentration of 10 μg/ℓ.

Phthalates were detected in several portions of the Process Area above the Permit-specified level of 10 μg/ℓ. Bis (2-ethylhexyl) phthalate is present in several background wells, in concentrations ranging from 11 μg/ℓ in MW-11B to 38 μg/ℓ in MW-11A. It is also found in MW-2A at a concentration of 13 μg/ℓ, and along the riverbank at concentrations ranging from not detected to 23 $\mu g/\ell$ in MW-21A. Bis (2-ethylhexyl) phthalate is found only in the Process Area. It is a common laboratory and sampling artifact.

Based on the observed results, no stabilization/corrective measures are warranted for these compounds.

7.6.7 Phenolic Compounds

Chlorinated phenols were detected in the vicinity of the Past Disposal Area and City of Nitro Dump, and sporadic concentrations are found along the southern property boundary. Chlorinated phenols detected include 2,4-dichlorophenol, pentachlorophenol, 2,4,5-trichlorophenol, and 2,4,6-trichlorophenol. A total chlorinated phenols distribution map, provided as Plate 4, shows the greatest concentration of chlorinated phenols is 1,360 $\mu g/\ell$ in MW-24A for the Past Disposal Area. Concentrations along the southern property boundary range from not detected to 124 $\mu g/\ell$ in MW-2A.

Total chlorinated phenols were present in the vicinity of the City of Nitro Dump and the former surface impoundments. The greatest concentration of chlorinated phenols exists at the former City of Nitro Dump with concentrations up to 1,800 $\mu g/\ell$ in WT-14A.

Non-chlorinated phenolic compounds were also detected in several portions of the Waste Treatment Area, including the former City of Nitro Dump, the former surface impoundments, and near the northern property boundary, adjacent to the City of Nitro Sewage Treatment Plant. The greatest concentration was at the City of Nitro Dump where monitoring well WT-14A contains 62,900 $\mu g/\ell$ of total phenols.

Nitrophenols were only detected in two monitoring wells, at concentrations of 41 $\mu g/\ell$ in WT-7A to 52 $\mu g/\ell$ in TD-3. These wells are downgradient of the former 2,4,5-T Building.

The observed frequency and magnitude of chlorinated phenolic compounds in wells MW-24A and WT-14A indicate that stabilization/corrective measures will be considered for these constituents in both primary areas of concern.

7.6.8 Polynuclear Aromatic Hydrocarbons (PAHs)

PAHs were detected only in well MW-7. Phenanthrene was the only constituent detected above the Permit-specified level, at a concentration of 15 $\mu g/\ell$. The presence of PAHs in well MW-7 is associated with the presence of separate-phase product in this well. The thickness of separate-phase product in this well was approximately 1.2 feet at the time of sampling.

The presence of separate-phase product warrants consideration of stabilization/corrective measures in this area.

7.6.9 Metals

Metals were detected in ground-water with sporadic exceedance of the Permit-specified levels. Detected metals include lead, chromium, cadmium, beryllium, and arsenic. Arsenic is found only in the vicinity of the Past Disposal Area, in concentrations ranging from 55 $\mu g/\ell$ in MW-24A to 280 $\mu g/\ell$ in MW-6A. Chromium, beryllium, and cadmium appear throughout the Process Area, however, lead only appears above the Permit-specified levels accompanied by chromium.

Metals were detected above the Permit-specified levels in the Waste Treatment Area. Chromium, cadmium, and lead were sporadically detected in concentrations ranging from 38 $\mu g/\ell$ of cadmium in TD-3 to 280 $\mu g/\ell$ cadmium in TB-1. In the Waste Treatment Area, lead was detected without an accompanying concentration of chromium.

Based on the low frequency of detections and observed concentrations, no stabilization/corrective measures for metals in ground-water are currently proposed.

7.6.10 Dioxins/Dibenzofuran Compounds

Monitoring wells WT-13A, WT-14A, WT-15A, TB-1, TB-3, TD-1, TD-3, and TD-5 were sampled for dioxin/dibenzofuran compounds. Analytical results of the dioxin/dibenzofuran samples reported no detections of dioxins or dibenzofuran compounds. Therefore, no stabilization/corrective measures for dioxin/dibenzofuran compounds are warranted.

7.6.11 Total Organic Halides

TOX was detected in all of the monitoring wells sampled during the RFI activities. TOX results are provided in Tables 12 and 15. Wells containing TOX greater than 1 mg/ℓ are located in the Past Disposal Area and along the riverbank in the Process Area; and near the former City of Nitro Dump and former surface impoundments in the Waste Treatment Area.

As TOX results are being used as an indicator only, no stabilization/corrective measures will be based solely on these results.

7.6.12 Total Organic Carbon

TOC results for the Process Area and the Waste Treatment Area are provided in Tables 12 and 15, respectively. As indicated, TOC was detected in Process Area ground-water samples in concentrations ranging from not detected in MW-1A to 910 mg/ℓ in MW-24A. TOC concentrations in the Waste Treatment Area ranged from not detected in WT-10A to 260 mg/ℓ in WT-14A. TOC results showed elevated levels (greater than 100 mg/ℓ) in wells located in the Past Disposal Area and the former City of Nitro Dump.

As TOC results are used as an indicator only, no stabilization/corrective measures will be based solely on these results.

7.6.13 pH Results

Field pH results are provided for the Process Area and the Waste Treatment Area in Tables 12 and 15, respectively. In the Process Area, pH varied from 5.30 in well MW-19A to 9.39 in MW-23A. The pH results in the Waste Treatment Area displayed greater variability. The pH ranged from 5.22 in WT-2 to 9.71 in WT-11C. Elevated pH levels (over pH 8.00) were observed in wells WT-7C, WT-8B, WT-8C, WT-9C, WT-11A, WT-11B, WT-11C, and WT-14A. Many of these wells are located near the former surface impoundments.

8.0 EVALUATION OF POTENTIAL STABILIZATION/CORRECTIVE MEASURES

As required for the RFI process, Sections 8.1 and 8.2 respectively present an evaluation of the need for, and scope of, potential stabilization/corrective measures at the facility. Data needs and proposed future activities to further define corrective measures requirements are presented in Section 8.3. A proposed project schedule is presented in Figure 8.

8.1 Evaluation of the Need for Potential Stabilization/Corrective Measures

The overriding RFI objective was to determine the need for potential stabilization/corrective measures. In order to meet this goal, the following supporting elements had to be accomplished:

- Identification of constituents of concern;
- Definition of horizontal and vertical distribution;
- Characterization of the site-specific geologic and hydrogeologic features which influence potential migration; and
- Identification of potential receptors.

As presented in Sections 6.0 and 7.0, each of these elements has been determined through implementation of the RFI. The analytical data collected during the RFI indicates that active corrective measures are not warranted for soils, sediments or surface water. Ground-water quality data identified that the highest observed dissolved-phase concentrations occur in two primary areas of concern. Residual concentrations in these two areas exceeded 1,000 $\mu g/\ell$ in shallow ground water for select chlorinated and aromatic VOCs (including TCE and benzene), and for select chlorinated phenolic compounds. Separate-phase product (kerosene) was also observed in one of these areas. These observations suggest that consideration of potential stabilization/corrective measures is appropriate.

The vertical distribution data identified the ground-water impact is predominantly restricted to the shallow (A-Series) monitoring wells. These shallow wells are representative of the less permeable silts and sands associated with the upper part of the alluvial aquifer. The aquifer testing data supports that the shallow ground water and associated constituents are not very mobile and do not represent a significant flow contribution to the Kanawha River, which has been identified as the discharge boundary for site ground water. With no potable use of ground water or surface water in the area, potential receptors are limited to non-potable use of the Kanawha River.

The need for potential stabilization/corrective measures will be focused on the shallow ground water nearest the Kanawha River in the primary areas of concern to be protective of surface-water quality. The two areas of concern identified in Section 6.5 will be refined by the use of a site-specific risk assessment. The risk assessment will be performed as part of the proposed stabilization/corrective measures study (Section 8.3) and will assist in determining areas where intrinsic remediation (areas other than the primary areas of concern) is appropriate. Potential stabilization/corrective measures are evaluated further in Section 8.2 below.

8.2 Evaluation of the Scope of Potential Stabilization/Corrective Measures

A variety of potential stabilization/corrective measures are presented in the following subsections based on the RFI findings. Potentially applicable technology types and process options are evaluated on the basis of engineering feasibility and reliability. The evaluation of engineering feasibility and reliability includes a consideration of such elements as commercial availability; demonstrated use of the technology; required implementation time and overall efficiency; and ease of operation, maintenance and repair.

An initial screening of potential technologies was presented in the RFI Work Plan. After review of the RFI results, the following technologies are considered potential stabilization/corrective measures for the identified primary areas of concern:

- intrinsic remediation and monitoring;
- in-situ ground-water treatment; and
- ground-water extraction and on-site treatment.

These potential stabilization/corrective measures are discussed in the Sections 8.2.1 through 8.2.3 below.

8.2.1 Intrinsic Remediation and Monitoring

Ground-water impact at the site can be reduced through natural, intrinsic remediation processes. This alternative may be applicable based on a determination of no potential threat to human health and the environment, and verification that the elevated VOCs will naturally attenuate over time. Intrinsic attenuation mechanisms include adsorption, volatilization, flushing and biological degradation. Intrinsic remediation processes have been demonstrated to be effective for many of the constituents of concern at the Nitro facility. Long-term monitoring may be required to demonstrate that constituent concentrations are decreasing.

8.2.2 In-Situ Ground-Water Treatment

As previously discussed, the most prevalent constituents detected in the two primary areas of concern are: aromatic hydrocarbons including benzene, chlorinated VOCs including TCE, and chlorinated phenols. As an alternative to ground-water extraction, in-situ ground-water treatment technologies that have been demonstrated for these constituents could be used. These technologies include sparging, bioventing and bioremediation, and can be applied in-situ using either trenches or extraction and injection wells. Major components typically required for these treatment systems include blowers, bubblers and associated piping, sources of oxygen and/or nutrients, and possibly a recirculation system.

The treatment system would need to be sized to maximize treatment efficiency and maintain appropriate retention times. The treatment systems would all need to address controls for any off-gases or residuals generated.

Reduction of potential constituent loading from the primary areas of concern to the Kanawha River would be the primary objective of the in-situ treatment system.

Prior to initiation of an in-situ treatment system corrective measure, additional analyses and pilot tests would be required to select and design an optimum treatment system configuration. These analyses and pilot tests can be developed using a phased approach.

8.2.3 Ground-Water Extraction

Extraction wells may be used to remove impacted ground water from areas with significant concentrations of constituents of concern. This would be accomplished by the construction and subsequent pumping of extraction wells that are screened in the shallow aquifer. Extraction wells would likely be installed along the downgradient boundary of the contaminant plume in the primary areas of concern. Pumps and piping would be installed to remove and convey the extracted ground water to the on-site Wastewater Treatment Plant.

The existing facility treatment system employs aeration and activated sludge biological treatment, and is already permitted to accept extracted ground water. Residuals are burned at the Boiler House. The extraction system can be readily installed with commercially available equipment and equipment already present at the site.

Separate-phase hydrocarbon, where present, can be removed along with ground water from wells using commercially-available pumps. Phase separation would involve the use of commercially available oil/water separators in the existing wastewater treatment system. Alternatively, separate-phase materials could be removed directly from the well using a separate product recovery pump and appropriate interface controls.

Ground-water extraction systems typically require long periods of time to reach ground-water cleanup goals. The site-specific factors which will influence the effective recovery of ground water are: the low permeability and transmissivity of the upper geologic unit; and adsorptive and ion exchange reactions between the chemicals of concern and the aquifer solids.

Reduction of potential constituent migration from primary areas of concern to the Kanawha River would be a primary objective of the extraction well system.

Prior to initiation of a ground-water extraction and treatment corrective measure, additional analyses and pilot tests may be required to refine the wastewater treatment process. These analyses and pilot tests can be developed using a phased approach beginning with the results obtained during this RFI.

8.3 Data Needs and Proposed Future Activities

As previously presented in the results sections of this document, the RFI has produced sufficient data to characterize the geology, hydrogeology, and nature and extent of constituent distribution at the facility. The resulting data needs are associated with the stabilization/corrective measures phase rather than the investigative phase. Specifically, the data objectives to be accomplished in the proposed Stabilization/Corrective Measures Study activities include:

- collect data as necessary to verify that the site-specific intrinsic attenuation mechanisms are favorable for constituents of concern;

- collect data as necessary to identify the site-specific threshold concentrations for constituents of concern that support the boundary delineations between areas of primary concern (which will likely require active corrective measures) and remaining areas where intrinsic attenuation mechanisms are appropriate; and

- collect data as necessary to develop remedial objectives for the selected stabilization/corrective measures.

To accomplish these data objectives in a timely manner, the facility proposes to pursue a stabilization/corrective measures program for ground water in the primary areas of concern. The stabilization/corrective measures program will include three primary elements:

- data collection through implementation of the Stabilization/Corrective Measures Study;
- data evaluation and presentation in a Stabilization/Corrective Measures Report; and
- implementation of selected stabilization/corrective measures.

Each of these elements is further described below.

The Stabilization/Corrective Measures Study will include data collection of site-specific parameters which influence intrinsic bioremediaton. These data may include: alkalinity; dissolved oxygen; redox potential; inorganic nutrients (nitrate, sulfate, nitrogen); organic nutrients (phosphorous); organic and inorganic carbon; ferric iron and bacteria cell count. The study will also include an analysis of constituent loading rates to the Kanawha River. Pilot testing may be conducted during the study, depending on the stabilization/corrective measure alternative selected.

Risk assessment will be an integral component of the overall program, and will be performed concurrently with the implementation of the Stabilization/Corrective Measures Study. The primary objectives of the assessment will be to verify the constituents of concern and the extent of the primary areas of concern and to establish the need for and extent of potential stabilization/corrective measures.

The Stabilization/Corrective Measures Report will summarize the findings of the risk assessment as well as all supporting data collected during the Stabilization/Corrective Measures Study. The final report will include:

- an introduction of the scope and purpose of the study;
- a description of current site conditions;
- a presentation of the results of the risk assessment and resulting proposed cleanup standards;
- a presentation of the results from pilot, laboratory, or bench-scale testing, if appropriate;
- a selection of the optimum stabilization/corrective measures alternatives; and
- an identification of proposed project deliverables and schedule.

The Stabilization/Corrective Measures Report will also include a complete evaluation of the selected alternative against the nine criteria required by the USEPA including:

- overall protection of human health and the environment;
- attainment of media-specific cleanup standards;

- control of the source(s) of releases;
- compliance with applicable waste management standards;
- long-term reliability and effectiveness;
- reduction of toxicity, mobility and volume;
- short-term effectiveness;
- implementability; and
- cost.

Stabilization/Corrective Measures Implementation will include the design, construction, operation, maintenance, and monitoring of the selected stabilization measures and will be performed in the manner as approved by the USEPA in the Stabilization/Corrective Measures Report.

9.0 WASTE MINIMIZATION PROGRAM

The Nitro plant has a formal, longstanding waste minimization program which targets individual waste minimization projects on a priority basis. Successfully completed waste minimization projects include an extensive upgrade of the Wastewater Treatment Plant, voluntary air emissions reductions including the Monsanto SARA Air 90% Reduction program, odor abatement, and effluent toxicity reduction among numerous additional efforts. Together, these projects have reduced the toxicity and volume of hazardous waste generated at the facility as well as minimizing releases to all media. Current and potential future waste minimization projects include replacing the process sewer system, removing additional waste streams from the process sewer, and minimizing process residue production.

The Nitro plant utilizes a hierarchy of waste minimization techniques to address these issues. In each case, the plant first considers source reduction opportunities, then recycling potentials, and, if the former are unfeasible, treatment technologies. Source reduction is the primary waste minimization candidate because it provides the greatest degree of environmental protection and is generally accompanied with some degree of financial return. Source reduction can include both substituting hazardous or toxic constituents with those that are non-hazardous or less toxic, implementing best management practices, and process modifications. Best management practices can include leak detection and repair, prompt cleanup of spills, and employee training. Another example of best management practice is the Nitro plant's commitment to replace the aging process sewer system. In-process recycling is one form of source control through process modification used at the Nitro plant.

Recycling, other than in-process, is a less attractive waste minimization technique as it still allows for waste generation and because more energy is generally required to recover the waste than to prevent its generation. Unlike source control, recycling has the intrinsic potential for spills of the waste, either on site or during transport.

Similarly, treatment systems do not mitigate waste generation and are generally expensive to build and operate. Unlike recycling, however, the raw materials are not recoverable or reusable after treatment.

Given the shortcomings of treatment and recycling, most of the Nitro plant waste minimization efforts have focused on source reduction. The following sections describe previous, current and future potential waste minimization projects at the plant.

9.1 Surface Impoundment Closure

Prior to 1988, the Nitro plant utilized several ponds in its wastewater treatment system. These included equalization basins, an emergency basin for high strength effluent, a sludge digester, and a limestone bed for pH adjustment. Except for the sludge digester and the A3 post-treatment ponds, which were not RCRA surface impoundments, the ponds were clean-closed by 1988 under the authority of the State of West Virginia. The focus of the pond closure program was source reduction through prevention of the potential production of contaminated leakage. Project expenditures associated with the pond closures total approximately $6.4MM to date.

The project included installing four equalization/storm-water tanks. Two of the tanks routinely receive and equalize influent as necessary to optimize steady state operation of the waste treatment plant. The remaining two tanks are reserved to prevent peak storm-water flows from taxing the waste treatment plant's hydraulic capacity, which formerly resulted in overflows to site soils and the Kanawha River. In addition, storm water from the non-process areas of the plant was segregated from discharges to the chemical sewer. New discharges to the Kanawha River were installed for non-process storm water, complete with an oil-water separator.

With the closure of the basins, a tertiary clarifier was installed to enhance the waste treatment plant's ability to reduce the discharge of total suspended solids (TSS). In addition, the biological treatment unit's aeration system was upgraded to provide more oxygen to the biomass; thereby further reducing the overall toxicity of the effluent stream. Also, the sludge digester was removed from routine service and replaced with a sludge thickener and holding system, which provides for sludge incineration in the plant boilers.

9.2 OCPSF Waste Treatment Plant Upgrade

In 1990, the Nitro plant became subject to enhanced Clean Water Act effluent standards for the Organic Chemical, Polymers and Synthetic Fibers Industry, known as OCPSF. Although the OCPSF standards are chemical specific, compliance required reducing the total organic carbon loading to the sewer in addition to major upgrades of the Wastewater Treatment Plant. Completed in 1993, the OCPSF Upgrade program included numerous projects at a total cost of approximately $5.3MM.

OCPSF projects included installing a Diversion Tank for high strength wastewater and primary analyzers at the #1 Lift Station. If a production unit reports an upset into the sewer, or if the analyzers indicate wastewater high in total organic carbon, the waste treatment operators can remotely shift the influent to the Diversion Tank. Additional projects included installing an oil-water separator, a new pH control system, and a Wastewater Treatment Plant digital control system (DCS). The oil-water separator gives the plant the ability to remove insoluble oils from the influent prior to biological treatment. The insoluble oils are now removed and burned for energy recovery, rather than being discharged. The new DCS system, ProVOX, allows much tighter control of the wastewater treatment operation and hence improves the effluent quality.

In addition to other waste minimization initiatives, the OCPSF projects reduced the BOD_5 loading of the plant effluent from almost 600 pounds per day (lb/day), in 1990, to less than 200 lb/day in 1993. Correspondingly, the number of OCPSF regulated chemicals detected in the effluent dropped from 16 in 1990, to 2 in 1993, and the plant routinely meets all of its NPDES Permit limits.

9.3 SARA Air 90% Reduction Program

In 1988, Monsanto Company announced an ambitious plan to reduce air emission of SARA 313 chemicals by 90% by the end of 1993. To contribute its part to meeting this challenge, the Nitro plant investigated every source of SARA chemicals in the plant. Although no emission source was too small to be considered, the larger sources were given priority treatment. By the first quarter of 1993, SARA Reduction projects were implemented at the Nitro plant for toluene, butanol, acetone, methanol, and xylene; at a total cost of approximately $6.3MM. As described below, the plant's approach in each of these projects was to look first for source reduction opportunities.

The toluene air emissions reduction project included several components, which reduced toluene losses to both the air and sewer. One source reduction project through in-process recycling involved installing a steam stripper to remove toluene from the NaMBT product, because any residual product became a waste in the downstream units. The recovered toluene is put back into the process. Another source reduction project involved reducing the potential for venting from process vessels by connecting them to a common header and vapor balancing system. A brine-cooled condenser now controls any toluene that exits the balancing system. The condensed toluene is put back into the process. Finally, a by-product recovery still was upgraded by installing a new brine-cooled condenser with an enhanced toluene recovery efficiency. Again, the condensed toluene is put back into the process.

The butanol air emissions reduction project is an example of source reduction through in-process recycling. The emphasis of the butanol reduction project was to prevent butanol losses to the sewer, as releases may either evaporate or potentially migrate to ground water. A wastewater stripper was installed to recover butanol from wastewater. The stripped butanol is returned to the process. Also, a new glycol-cooled condenser was installed to improve condensation of butanol from vessel vents. Condensed butanol is returned to the process.

The acetone reduction project included both a wastewater stripper and a vent scrubber. In this source reduction through in-process recycling project, the acetone absorbed in the scrubber bottoms is combined with existing wastewater streams and sent to the new stripper. The acetone is recovered from the stripper overheads and returned to the process. This minimizes both direct acetone emissions and the acetone load to the sewer, which in turn minimizes both evaporation from the waste treatment system and the potential for migration to ground water.

The methanol reduction project involved optimizing the operation of the methanol recovery column to maximize recovery of methanol from unit wastewater. The recovered methanol is returned to the process. The project also included replacing a steam eductor decant system with a vacuum pump. This prevents the generation of a methanol wastewater stream from the eductor condensate. This project reduces both methanol evaporation from the waste treatment system and the potential for ground-water contamination.

The xylene reduction project achieved source reduction by preventing waste generation. The project included the replacement of a leaking product dryer which had previously allowed xylene-laden air to escape. A vapor balancing system was installed on process vessels to help prevent venting. A condenser was installed on the residue loading system vent to recovery xylene emissions. In addition, a new coalescer system was installed to recover xylene from wastewater prior to discharge in the sewer.

Perhaps the greatest achievement of the SARA reduction program was to discontinue using TCE. Through intense research, an alternate solvent was identified and developed for the product, allowing the plant to completely eliminate potential releases of this chemical. The project completely eliminated TCE losses to the sewer, at a cost of approximately $1.9MM.

In total, the SARA Air 90% Reduction projects were extremely successful, resulting in a reduction of approximately 540,000 lbs of SARA air emissions, an 89.5% reduction from 1987 levels. Since many of the projects included wastewater stripping or separation, they also resulted in a significant decrease of SARA releases to the sewer, thus minimizing the potential impacts to the environment. Most strikingly, the reductions were accomplished almost entirely through source reduction, either through in-process recycling or preventing waste generation. This allowed the plant to maximize yields while minimizing releases. A low percentage of the reductions were accomplished through treatment.

9.4 Odor Abatement

The Nitro plant primarily manufactures sulfur-based chemicals and, since sulfur chemicals are generally malodorous at low concentrations, the plant has implemented several projects specifically intended to reduce odorous emissions. These projects include upgrading the sulfur recovery unit, upgrading the scrubbing capacity at CaMHA, installing wastewater oxidation systems in PVI and upgrading the sulfur dichloride/monochloride unloading station.

In 1987, the sulfur recovery unit was upgraded to include a third Claus bed and a tailgas incinerator. This unit converts waste hydrogen sulfide to sulfur, which is then used as a raw material in the original manufacturing process; thus, it is an example of source reduction through in-process recycling. The upgrade raised the conversion and recovery efficiency to greater than 97%. Also, prior to the upgrade, the residual hydrogen sulfide exiting the sulfur recovery unit, called tailgas, was occasionally vented directly to the atmosphere. The tailgas incinerator fully combusts this hydrogen sulfide and eliminates this source of odorous emissions.

In 1990, a fabric filter was installed upstream of the dryer scrubber in CaMHA, at a cost of \$2.0MM. Prior to installing the filter, solids from the dryer plugged the scrubber, which lessened its ability to scrub odorous organic gases and which resulted in the discharge of solids into the sewer. The gases include methyl mercaptan and dimethyl disulfide. The filter prevents both the plugging and the solids loss, since the solids collected by the filter are recovered. The scrubbing capacity of the unit was furthered in 1994 by recycling the exhaust from the rotary filter hood into the front end of the dryer. This recycled air replaces fresh air in the dryer and allows for scrubbing the exhaust from the filter hood.

PVI production uses cyclohexyl mercaptan, which has a foul odor at very low concentrations. In the process, a small amount of mercaptan is lost to the sewer system. This lost mercaptan evaporates from the sewer system, resulting in a bad odor. The PVI odor control project included installing a hypochlorite scrubbing system, which bleeds bleach into the sewer at the amount necessary to convert the mercaptan to a disulfide, which is far less odorous.

Sulfur dichloride and sulfur monochloride react with water to generate hydrogen chloride and sulfur dioxide. The old unloading system utilized a single stage venturi scrubber to control releases of these chemicals during unloading. Control efficiency of the single stage scrubber was too low to prevent emissions of odorous clouds, so an upgraded scrubbing system was installed in 1994. The new system utilizes three venture scrubbers in series and virtually eliminates odorous releases.

9.5 Toxicity Reduction

In addition to the waste treatment plant upgrades implemented as part of the RCRA Ponds Closure and OCPSF programs, the Nitro plant continues to implement waste minimization projects intended to reduce the toxicity of the plant effluent. The focus of these projects has been to reduce the generation of toxic wastewaters in the production units, rather than upgrading the treatment efficiency of the biological system. Completed projects include optimizing the Santocure CBS production process and adding to it an oil pretreatment step. This step breaks down toxic oils that formerly were discharged to the sewer. The treated oils are recovered in the amine recovery column and returned to the process.

The amine recovery system was also optimized. This project included upgrading the process controls and installing a new acid scrubber at a cost of $2.2MM. The new scrubber uses a lower concentration acid to scrub amine vapors from process vents, greatly minimizing the amount of salt discharged into the sewer. The new scrubber system also allows the rotary filter to operate as a total enclosure, thus capturing more amine vapors for recovery.

The plant has also installed Total Organic Carbon analyzers in the sewer lines from each major production area. Although it is too early to assess the analyzers' effectiveness, the goal is to use them as an early warning system to detect process upsets or spills into the sewer.

The voluntary SARA reduction projects have also contributed to toxicity reduction. By minimizing the amounts of acetone, butanol, methanol, toluene, and xylene in the process sewer, implementation of these projects has resulted in the reduction of a substantial portion of the easily biodegradable loading to the biological treatment system. Lacking this attractive food, the biomass has become more efficient at degrading the more toxic compounds, resulting in better treatment of these compounds and a lower toxicity effluent.

9.6 High Hazardous Material Containment

The Monsanto Company issued in the mid-1980s a set of guidelines for the use and holding of "high hazardous materials" (HHM), which included hydrogen sulfide, chlorine and ammonia at the Nitro plant. The HHM guidelines effect source reduction by prescribing specific materials of construction; and maintenance, inspection and design criteria for equipment in the HHM chemical services. The guidelines minimize the risk of a release or spill of the hazardous material, at a cost to the Nitro plant of approximately $4.4MM.

9.7 Miscellaneous Waste Minimization Programs

In addition to the above waste minimization programs, the Nitro plant has also implemented many miscellaneous waste minimization projects. These include the HEAF replacement project, several vacuum stripping projects and several process control projects. The vacuum stripping upgrade projects were completed in Buildings 34 and 91. These projects replaced steam eductors with vacuum pumps. The pumps allow for ambient pressure non-contact condensation of the discharge, and condensed organics are recycled back into the process. The old steam eductors discharged the organics either into the sewers or to the atmosphere.

The process control improvements included installing ProVOX in Building 44 in addition to the waste treatment plant, upgrading the UNIVOX system in Building 34 and upgrading the Allen Bradley PLC in Building 91-1 and Building 14. Completed in 1990, these process control upgrades provided significant source reductions, for several reasons. Better control increases the right-first-time percentage, which reduced the amount of off-spec product to be reworked or disposed. Reducing rework minimizes waste because rework results in solvent losses to the air, sewers and as residue. Better process control also minimizes both routine and emergency releases. The controllers' effects include minimizing swings in temperature and pressure, preventing vessel overflows, and enhancing oil-water separation.

Completed in 1995 at a cost of approximately $3.0MM, the HEAF replacement represents another large-scale source reduction project through in-process recycling. Formerly, the dryer in Building 47 vented to the HEAF, a fabric filter that scrolled through the vent to collect product dust emissions. The used filter media was wound onto a take-up roll and landfilled. This system was replaced with a wet scrubbing system, into which a previously uncontrolled dryer vent was also added. The blowdown from the scrubber system is a slurry of product and water, which is returned into the process for recovery of the product.

9.8 Future Waste Minimization Opportunities

The Nitro plant continues to identify and evaluate future waste minimization opportunities. Future projects are being evaluated through the facility's formal Waste Minimization Coordination Team. The team ranks waste minimization opportunities against several priority drivers. First and foremost, any project required by current regulations must be completed by the statutory deadline. Second, projects that will be required by future regulations are considered. Factors to be considered include the volume and nature of the waste stream involved and its potential to human health and the environment and the cost savings provided by minimizing the waste stream. In addition, the ability of the plant to fund the waste minimization project must be considered. As with prior projects, these waste minimization efforts will look first towards source reduction opportunities, then recycling opportunities, and finally treatment.

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TABLES

Table 1. Monitoring Well Summary Table. Monsanto Company; Nitro, West Virginia.

Well Designation	Installation Date	Location	Total Depth (ft)	Screen Setting (ft)	Diameter (inches) Casing	State Plane Coordinates (ft) Northing	State Plane Coordinates (ft) Easting	Top-of-Casing Elevation (ft.)	Ground Surface Elevation (ft.)	Depth to Water (ft.) on 9/20/94	Ground-Water Elevation (ft.) on 9/20/94
Waste Treatment Area											
TB-1	9/14/81	2,4,5-T Building	32	27-32	2"	527385.70	1760123.61	593.07	591.4	25.21	567.86
TB-3	9/16/81	2,4,5-T Building	32	27-32	2"	527424.48	1760030.87	592.90	591.8	26.18	566.72
TD-1	NA	2,4,5-T Building	32	27-32	2"	527471.32	1760182.10	592.20	590.4	24.72	567.48
TD-3	NA	2,4,5-T Building	30	27-32	2"	527518.22	1760073.84	590.92	589.5	24.40	566.52
TD-5	NA	2,4,5-T Building	30	25-30	2"	527538.36	1759999.72	589.49	588.4	22.98	566.51
WT-1[(1)]	2/4/92	Emergency Basin	33.5	13.5-33.5	4"	526771.35	1760979.93	590.33	588.6	18.55	571.78
WT-2	9/1/81	Emergency Basin	53.5	16.5-53.3	4"	526294.56	1760733.01	590.13	588.4	17.57	572.56
WT-3	9/14/81	Surge Basin	55	15-55	4"	527002.78	1760299.42	590.67	589.6	18.76	571.91
WT-4A	9/14/81	Limestone Bed	40	25-40	4"	527385.69	1760258.72	591.82	590.4	21.81	570.01
WT-4B	9/4/81	Limestone Bed	58	41-58	4"	527377.73	1760255.20	592.06	590.5	23.86	568.20
WT-5A	9/12/81	Digester	43	28-43	4"	572732.59	1760459.29	589.99	588.8	23.33	566.66
WT-5B	9/12/81	Digester	58	43-58	4"	527724.96	1760450.85	589.93	588.7	22.94	566.99
WT-6	9/3/81	Digester	53	18-53	4"	527586.80	1760709.73	589.09	587.5	18.18	570.91
WT-7A	11/28/85	Activated Sludge Basin	41.5	21.5-41.5	2"	527588.94	1760101.49	589.25	587.5	22.72	566.53
WT-7B	11/28/85	Activated Sludge Basin	56.6	41.5-56.5	2"	527602.11	1760121.61	589.16	587.4	22.81	566.35
WT-7C	11/28/85	Activated Sludge Basin	73	62-72	2"	527599.91	1760119.55	589.12	587.3	22.68	566.44
WT-8A	12/04/85	Polishing Basin	39	19-39	2"	527736.75	1761254.41	589.42	587.6	19.25	570.17

NA = Information not available at this time.
[(1)]Monitoring well was replaced by new monitoring well on 2/3/92 through 2/7/92 within 15 feet of original location.

Well Designation	Installation Date	Location	Total Depth (ft)	Screen Setting (ft)	Diameter (inches) Casing	State Plane Coordinates (ft) Northing	State Plane Coordinates (ft) Easting	Top-of-Casing Elevation (ft.)	Ground Surface Elevation (ft.)	Depth to Water (ft.) on 9/20/94	Ground-Water Elevation (ft.) on 9/20/94
WT-8B	12/04/85	Polishing Basin	52	37-52	2"	527732.57	1761255.87	589.31	587.4	19.08	570.23
WT-8C	12/04/85	Polishing Basin	70	60-70	2"	527728.43	1761258.20	587.13	586.6	16.62	570.51
WT-9A(1)	2/5/92	Emergency Basin	50	30-50	4"	526938.14	1760750.51	599.71	598.0	27.98	571.73
WT-9B(1)	2/5/92	Emergency Basin	68.5	48.5-68.5	4"	526941.59	1760744.01	598.61	596.6	28.36	570.25
WT-9C(1)	2/6/92	Emergency Basin	80	72-80	4"	526944.93	1760736.58	599.53	598.0	27.88	571.65
WT-10A	1/15/85	Upgradient	39	19-39	2"	526337.47	1760619.82	590.13	588.4	17.64	572.49
WT-10B	1/15/85	Upgradient	54	39-54	2"	526339.45	1760615.98	590.09	588.4	17.60	572.49
WT-10C	1/15/85	Upgradient	70	60-70	2"	526341.58	1760611.89	590.30	588.6	17.76	572.54
WT-11A	1/23/85	Off-Site	42	22-42	2"	526964.40	1761221.25	588.60	588.9	17.11	571.49
WT-11B	1/23/85	Off-Site	54	39-54	2"	526966.51	1761215.92	588.47	588.8	17.21	571.26
WT-11C	1/23/85	Off-Site	74	64-74	2"	526969.03	1761211.45	588.27	588.6	16.98	571.29
WT-13A	8/28/94	City of Nitro Dump	34	14-34	4"	527212.70	1759435.46	590.82	589.1	24.51	566.31
WT-14A	8/27/94	City of Nitro Dump	40	15-35	4"	527368.89	1759863.07	593.57	591.9	26.06	567.51
WT-15A	8/27/94	City of Nitro Dump	24	9-24	4"	526862.43	1759788.61	589.08	587.4	9.65	579.43

NA = Information not available at this time.
(1)Monitoring well was replaced by new monitoring well on 2/3/92 through 2/7/92 within 15 feet of original location.

Well Designation	Installation Date	Location	Total Depth (ft.)	Screen Setting (ft.)	Diameter (inches) Casing	State Plane Coordinates (ft) Northing	State Plane Coordinates (ft) Easting	Top-of-Casing Elevation (ft.)	Ground Surface Elevation (ft.)	Depth to Water (ft.) on 9/20/94	Ground-Water Elevation (ft.) on 9/20/94
Process Area											
MW-1A	9/8/83	Upgradient	32	20-30	2"	523682.79	1758656.75	594.37	592.5	18.97	575.40
MW-1B	1/2/85	Upgradient	55	40-55	2"	523677.68	1758654.66	594.38	592.5	19.07	575.31
MW-2A	9/9/83	FMC Boundary	32	20-30	2"	523985.28	1757719.85	592.60	591.2	19.00	573.60
MW-2B	1/14/85	FMC Boundary	55	40-55	2"	523983.89	1757724.14	592.84	591.1	19.41	573.43
MW-3A	9/9/83	Riverfront	35	25-35	2"	524399.80	1757078.36	598.85	597.2	28.50	570.35
MW-3B	12/20/84	Riverfront	61	46-61	2"	524405.89	1757080.05	599.24	597.2	28.59	570.65
MW-4A	9/12/83	Riverfront	38	27.5-37.5	2"	524730.40	1757237.59	598.56	596.4	27.33	571.23
MW-4B	NA	Riverfront	61.5	41.5-61.5	4"	524725.90	1757235.40	598.05	596.3	26.76	571.29
MW-5A	8/31/83	Riverfront	33	23-33	2"	525290.85	1757548.36	594.65	593.3	25.58	569.07
MW-5B	NA	Riverfront	56	41-56	2"	525293.92	1757544.43	594.91	593.0	25.76	569.15
MW-6A	9/1/83	Past Disposal Area	30	20-30	2"	525706.25	1757858.98	591.39	590.0	24.65	566.74
MW-6B	12/17/84	Past Disposal Area	58	43-58	2"	525709.00	175785.23	592.76	591.0	23.33	569.43
MW-7	10/1/83	Past Disposal Area	30	20-30	2"	526267.61	1758312.17	594.03	592.5	26.89	567.14
MW-8	9/1/83	Past Disposal Area	30	20-30	2"	525618.70	1758192.64	588.30	586.7	19.85	568.45
MW-10	9/7/83	Process Area	29.5	17-27	2"	524351.11	1758124.90	590.20	588.3	16.43	573.77
MW-11A	9/6/83	Upgradient	31	19-29	2"	524491.39	1758970.37	591.13	589.4	16.67	574.46

NA = Information not available at this time.
[1]Monitoring well was replaced by new monitoring well on 2/3/92 through 2/7/92 within 15 feet of original location.

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MW-11B	9/6/83	Upgradient	NA	38-48	2"	524488.69	1758968.99	591.01	589.6	16.56	574.45
MW-12	9/7/83	Process Area	29.5	18-28	2"	524562.91	1758459.94	589.80	588.4	15.60	574.20
MW-13	9/13/83	Process Area	29	18-28	2"	523940.91	1758479.24	590.84	589.2	15.30	575.54
MW-14	9/2/83	Process Area	29	18-28	2"	525369.74	1758627.78	589.53	588.0	15.93	573.60
MW-15	9/2/83	Process Area	NA	10-20	2"	NA	NA	588.09	586.3	13.92	574.17
MW-17A	1/31/85	FMC Boundary	40	30-40	2"	523820.34	1758152.95	591.53	589.9	17.40	574.13
MW-17B	2/4/85	FMC Boundary	56	36-56	4"	523822.81	1758146.49	591.85	590.4	17.66	574.19
MW-18A	2/5/85	FMC Boundary	40	30-40	2"	524080.27	1757438.28	593.20	591.3	21.03	572.17
MW-18B	2/5/85	FMC Boundary	55	40-55	2"	524083.03	1757433.50	592.59	590.7	20.33	572.26
MW-19A	1/2/85	Process Area	40	30-40	2"	524570.10	1757130.91	597.58	595.7	28.88	568.70
MW-19B	1/2/85	Process Area	62	47-62	2"	524575.05	1757132.68	598.17	597.0	27.17	571.00
MW-20A	1/29/85	Riverfront	40	30-40	2"	525073.89	1757371.43	596.71	594.9	27.38	569.33
MW-20B	1/29/85	Riverfront	57	42-57	2"	525087.71	1757347.47	596.76	594.8	27.22	569.54
MW-21A	1/10/85	Riverfront	40	30-40	2"	525486.77	1757666.51	592.65	591.7	25.05	567.60
MW-21B	1/11/85	Riverfront	58	43-58	2"	525490.68	1757669.51	594.07	592.4	25.43	568.64
MW-22R	8/26/94	Past Disposal Area	40	18-38	4"	525893.64	1757941.10	596.53	594.0	28.99	567.54
MW-23A	8/24/94	FMC Boundary	35	19.8-34.8	4"	524252.90	1757009.16	598.82	597.3	28.28	570.54
MW-24A	8/25/94	Niran Residue Pit	35	15-35	4"	525618.99	1757812.17	594.58	592.1	26.12	568.46

NA = Information not available at this time.
[1] Monitoring well was replaced by new monitoring well on 2/3/92 through 2/7/92 within 15 feet of original location.

Table 2. Field Duplicate Sample Review. Monsanto Company; Nitro, West Virginia.

Sample ID	Parameter (unit)	Detection Limit	Sample Result	Duplicate Result	Relative Percent Difference (RPD) (%)
10D	**Inorganics (mg/kg)**				
	Arsenic	0.2	2.1	2.7	25
	Barium	0.5	130	130	--
	Beryllium	0.5	1.1	1.2	--
	Cadmium	0.5	1.4	0.7	--
	Chromium	1	13	13	0
	Copper	1	8	7	13
	Lead	5	16	12	--
	Nickel	2	13	13	0
	Zinc	0.5	58	47	21
SED-1	**Inorganics (mg/kg)**				
	Arsenic	0.2	0.6	0.6	--
	Barium	0.5	16	24	40
	Chromium	1	1	1	--
	Copper	1	2	2	--
	Nickel	2	2U	2	--
	Selenium	0.2	0.2U	0.2	--
	Zinc	0.5	5.4	6.2	14
MW-19A	**Volatile Organic Compounds (μg/ℓ)**				
	Trichloroethene	5	140	160	13
	cis-1,2-Dichloroethene	5	130	170	27
	Vinyl chloride	5	29	37	24
	1,1-Dichloroethane	5	5	5	--
	Chlorobenzene	5	15	17	--
	Inorganics (mg/ℓ)				
	Arsenic	0.004	0.021	0.018	--
	Barium	0.01	0.69	0.06	168
	Beryllium	0.01	0.02	0.01U	--
	Cadmium	0.01	0.03	0.01U	--
	Chromium	0.02	0.25	0.02U	--
	Copper	0.02	0.25	0.02U	--
	Lead	0.005	0.20	0.20	0
	Mercury	0.0002	0.0007	0.0007	0
	Nickel	0.04	0.35	0.09	--
	Zinc	0.01	0.99	0.24	122
	TOC	<1	1U	2	--
	TOX	0.02	0.34	0.20	52

U = Not detected above method detection limit.
B = Detected in trip, field, or method blank.
-- = Not computed due to non-detection of compound, or result is less than 5 times the detection limit.

mg/kg = Milligrams per kilogram.
μg/ℓ = Micrograms per liter.
mg/ℓ = Milligrams per liter.

Table 2. **Field Duplicate Sample Review. Monsanto Company; Nitro, West Virginia.**

Sample ID	Parameter (unit)	Detection Limit	Sample Result	Duplicate Result	Relative Percent Difference (RPD) (%)
WT-10A	**Inorganics (mg/ℓ)**				
	Arsenic	0.004	0.01	0.005	--
	Barium	0.01	0.19	0.12	45
	Chromium	0.02	0.05	0.02U	--
	Copper	0.02	0.04	0.02U	--
	Lead	0.005	0.032	0.01	--
	Zinc	0.01	0.17B	0.05B	109
	TOX	0.02	0.03	0.04	--
TD-5	**Volatile Organic Compounds (µg/ℓ)**				
	Trichloroethene	5	7	7	--
	cis-1,2-Dichloroethene	5	6	6	--
	Chlorobenzene	5	9	8	--
	Inorganics (mg/ℓ)				
	Arsenic	0.004	0.005	0.006	--
	Barium	0.01	0.11	0.54	132
	Lead	0.005	0.013	0.017	--
	Nickel	0.04	0.07	0.07	--
	Zinc	0.02	0.41	0.37	10
	TOC	1.0	20	21	5
	TOX	0.02	0.57	0.54	5

U = Not detected above method detection limit.
B = Detected in trip, field, or method blank.
-- = Not computed due to non-detection of compound, or result is less than 5 times the detection limit.

mg/kg = Milligrams per kilogram.
µg/ℓ = Micrograms per liter.
mg/ℓ = Milligrams per liter.

Table 3. Summary of Detected Volatile Organic Compound Analytes for Split Samples. Monsanto Company, Nitro, West Virginia.

Parameter	MW-1A		MW-23A		MW-6A		TD-3		WT-13A	
Laboratory	WVDNR	Monsanto	WVDNR	Monsanto	WVDNR	Monsanto	WVDNR	Monsanto	WVDNR	Monsanto
Chloroform	4.6	10	86.4	81	1.7J	5U	2.0J	5U	Q	5U
trans-1,2-Dichloroethene	Q	5U	15.8	13	4.3	5U	Q	5U	Q	5U
cis-1,2-Dichloroethene	Q	5U	146.1	170	228.3	320	2.8J	5U	13.4	17
Carbon tetrachloride	Q	5U	228.9	250	Q	5U	Q	5U	Q	5U
Benzene	Q	5U	6.3J	7	20.3	18	51.0	41	4.6J	5U
Trichloroethene	Q	5U	1,045.9	1,300	90.0	68	9.6	7	851.1	610
Chlorobenzene	Q	5U	3.6J	5U	2.9J	5U	628.3	990	4.8J	11
Toluene	Q	5U	Q	5U	153.8	130	5.7	5U	3.6J	5U
Ethylbenzene	Q	5U	Q	5U	86.2	67	Q	5U	Q	5U
Total Xylenes	Q	5U	Q	5U	264.8	250	1.9J	5U	Q	5U
Isopropylbenzene	Q	Q	Q	Q	0.9J	Q	Q	Q	Q	Q
1,2,4-Trimethyl Benzene	Q	Q	Q	Q	4.7J	Q	Q	Q	Q	Q
Isopropyltoluene	Q	Q	Q	Q	2.3J	Q	Q	Q	Q	Q
4-Methyl 2-Pentanone	Q	100U	Q	100U	Q	54	Q	100U	Q	100U
Vinyl Chloride	Q	10U	Q	10U	Q	550	Q	10U	Q	10U
Carbon Disulfide	Q	5U	Q	5U	Q	5U	Q	10	Q	5U

WVDNR results obtained using SW-846 Method 8260. Monsanto results obtained using SW-846 Method 8240.
J = Compound detected above detection limit, but less than lowest concentration level of the calibration table.
U = Not detected.
Q = Analytical result not available.

Table 4. Hydraulic Conductivity Values. Monsanto Company; Nitro, West Virginia.

Well I.D.	Depth (ft)	Hydraulic Conductivity (ft/day)
"A" Series		
MW-3A	35.0	0.39
MW-4A	38.0	0.23
MW-5A	33.0	0.80
MW-6A	30.0	0.11
MW-10	29.5	24
MW-21A	40.0	0.21
MW-22R	40.0	0.47
WT-5A	43.0	14
WT-7A	41.5	4.5
WT-13A	34.0	0.11
TD-5	30.0	0.99
TW-1	44.5	0.010
TW-2	42.0	0.11
Geometric Mean (ft/day):		0.51
"B" Series		
MW-3B	61.0	8.5
MW-4B	61.5	2.8
MW-5B	56.0	6.1
MW-6B	58.0	4.9
MW-21B	58.0	13
WT-3	55.0	7.2
WT-5B	58.0	12
WT-7B	56.6	5.1
Geometric Mean (ft/day):		6.7

RFI REPORT AND STABILIZATION/CORRECTIVE MEASURES PLAN
Volume I of II

MONSANTO NITRO PLANT

May 5, 1995

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Table 5. Summary of Detected Analytes for VOCs and Target Metal Compounds for Building 46 Incinerator Soil Samples. Monsanto Company; Nitro, West Virginia.

Parameter[1,2]	Permit-Specified Levels[3]	Sample Identification and Date Collected										
		1S 5/6/92	1D 5/6/92	2S 5/6/92	2D 5/6/92	3S 5/6/92	3D 5/6/92	4S 5/6/92	4D 5/7/92	5S 5/6/92	5D 5/7/92	6S 5/6/92
Acetone	1,000	0.03 B	0.14 B	0.01 B	0.05 B	0.002 B	0.08 B	0.08 B	0.04 B	0.07 B	0.04 B	0.100 JB
Acrolein+	300	0.1 U	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	1.30 U	1.20 U	1.30 U
Carbon disulfide	1,000	0.003 J	0.008	0.006 U	0.002 J	0.006 U	0.006 U	0.002 J	0.009	0.006 U	0.006 U	0.06 U
Toluene	1,000	0.003 J	0.006 U	0.003 J	0.02	0.006 U	0.006 U	0.004 J	0.006 U	0.008	0.01	0.030 J
Trichloroethene	1.0	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.07
Total xylenes	1,000	0.005 J	0.006 U	0.006 U	0.002 J	0.006 U	0.007	0.004 J	0.006 U	0.004 J	0.002 J	0.02 J
Methylene Chloride	2.0	0.004	0.003	0.002	0.002	0.002	0.004	0.002	0.002	0.002	0.002	0.029
Benzene	0.5	0.002	0.003	ND	ND	ND	0.002	ND	ND	0.003	0.003	ND
1,2 Dichlorobenzene	1,000	ND	ND	ND	ND	ND	ND	ND	0.009	ND	ND	ND
Ethylbenzene	1,000	ND	ND	ND	ND	ND	ND	0.001	ND	0.002	ND	ND
trans-1,2 Dichloroethene	300	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.030
[redacted]	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	[redacted]
Chlorobenzene	300	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.030
2-Butanone	1,000	0.005	0.03	ND	0.008	0.004	0.03	0.007	0.002	0.005	0.007	ND
4-Methyl-2-Pentanone	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND
Formaline, as formaldehyde	–	1.8	0.62 U	1.4	24.9	2.1	4.1	1.0	1.7	1.7	3.4	4.5
Methanol	–	6 U	6.2 U	6.1 U	6.4 U	6.2 U	6.6 U	6.2 U	6.6 U	6.6 U	0.001 J	6.3 U
Total organic halogen (TOX)	–	2.7	0.37 U	0.9	0.39 U	0.37 U	0.39 U	0.7	0.39 U	4.3	1.7	4.9
Total organic carbon (TOC) (% carbon)	–	0.89	0.53	0.54	0.61	0.31	0.36	0.41	0.58	0.78	0.34	0.51
Arsenic	0.5											
Barium	1,000											
Beryllium	0.2											
Cadmium	40											
Chromium	400											
Copper	–											
Lead	–											
Mercury	20											
Nickel	1,000											
Selenium	200											
Zinc	–											

J = Result is detected below the detection level.
B = Compound also detected in method blank.
-- = Not available.
ND = Not detected.
NA = Not analyzed.

* = Sample 7S DUP is designated "10S" in VI Report.
† = Results exceed permit-specified levels.
[1] Concentrations in milligrams per kilograms (mg/kg) dry weight basis, unless otherwise noted.
[2] Concentrations in micrograms per liter (µg/L).
[3] Permit-specified levels from RCRA permit in milligrams per kilogram (mg/kg).

Table 5. Summary of Detected Analytes for VOCs and Target Metal Compounds for Building 46 Incinerator Soil Samples. Monsanto Company; Nitro, West Virginia.

		Sample Identification and Date Collected										
Parameter[1] [2]	Permit-Specified Levels[3]	6D 5/6/92	7S 5/7/92	7S* DUP 5/7/92	7D 5/7/92	8S 5/6/92	8D 5/6/92	9S 5/7/92	9D 5/7/92	10S 8/25/94	10D 8/25/94	10M DUP of 10D 8/25/94
Acetone	1,000	0.2 B	0.100 B	0.2 B	0.02 B	0.6 JB	0.1 B	0.03 B	0.2 B	0.16	0.1 U	0.46
Acrolein+	300	1.30 U	1.3 U	1.3 U	0.1 U	13 U	0.1 U	0.1 U	0.1 U	NA	NA	NA
Carbon disulfide	1,000	0.06 U	0.06 U	0.006 U	0.006 U	0.6 U	0.003 J	0.006 U	0.002 J	0.005 U	0.005 U	0.005 U
Toluene	1,000	0.07	0.2	0.2	0.02	0.6 U	0.02	0.003 J	0.02	0.008	0.005 U	0.005 U
Trichloroethene	1.0	0.1	0.2	0.1	0.1	0.6 U	0.02	0.002 J	0.05	0.005 U	0.005 U	0.005 U
Total xylenes	1,000	0.02 J	0.06 J	0.02 J	0.003 J	0.6 U	0.002 J	0.006 U	0.02	0.008	0.005 U	0.005 U
Methylene Chloride	2.0	0.019	0.03	0.028	0.002	ND	0.003	0.004	ND	0.005 U	0.005 U	0.005 U
Benzene	0.5	ND	ND	ND	0.002	ND	ND	ND	ND	0.005 U	0.005 U	0.005 U
1,2 Dichlorobenzene	1,000	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
Ethylbenzene	1,000	ND	ND	ND	ND	ND	ND	ND	ND	0.005 U	0.005 U	0.005 U
trans-1,2 Dichloroethene	300	0.020	0.04	0.03	0.05	ND	0.03	ND	ND	0.005 U	0.005 U	0.005 U
Tetrachloroethene	0.2	1.300 †	0.7	1	0.02	0.14	0.005	ND	ND	0.005 U	0.005 U	0.005 U
Chlorobenzene	300	0.02	ND	ND	0.002	ND	0.01	ND	ND	0.005 U	0.005 U	0.005 U
2-Butanone	1,000	0.02	0.03	ND	0.003	ND	0.01	0.004	0.03	0.1 U	0.1 U	0.1 U
4-Methyl-2-Pentanone	1,000	ND	0.002	ND	ND	ND	0.002	ND	ND	0.01 U	0.01 U	0.01 U
Formaline, as formaldehyde	–	2.3	0.65 U	0.7	0.64 U	2.4	0.64 U	4.3	1.6	NA	NA	NA
Methanol	–	6.4 U	ND	0.09 J	6.4 U	6.6 U	6.4 U	6.1	1.8 J	NA	NA	NA
Total organic halogen (TOX)	–	9.4	1.4 B	0.8	0.4 B	0.5 B	1.1	0.8 B	1.6	NA	NA	NA
Total organic carbon (TOC) (% carbon)	–	0.32	0.57	0.9	0.54	0.99	0.23	0.41	1.2	NA	NA	NA
[redacted]	0.5		NA	NA	NA	NA	NA	NA	NA	[redacted]	[redacted]	[redacted]
Barium	1,000		NA	NA	NA	NA	NA	NA	NA	72	130	130
[redacted]	0.2		NA	NA	NA	NA	NA	NA	NA	[redacted]	[redacted]	1.2 †
[redacted]	40		NA	NA	NA	NA	NA	NA	NA	0.9	1.4	[redacted]
Chromium	400		NA	NA	NA	NA	NA	NA	NA	26	13	13
Copper	–		NA	NA	NA	NA	NA	NA	NA	19	8	7
Lead	–		NA	NA	NA	NA	NA	NA	NA	40	16	12
Mercury	20		NA	NA	NA	NA	NA	NA	NA	0.25 U	0.25 U	0.25 U
Nickel	1,000		NA	NA	NA	NA	NA	NA	NA	14	13	13
Selenium	200		NA	NA	NA	NA	NA	NA	NA	0.2 U	0.2 U	0.2 U
Zinc	–		NA	NA	NA	NA	NA	NA	NA	52	58	47

J = Result is detected below the detection level.
B = Compound also detected in method blank.
–= Not available.
ND = Not detected.
NA = Not analyzed.

* = Sample 7S DUP is designated "10S" in VI Report.
† = Results exceed permit-specified levels.
[1] Concentrations in milligrams per kilograms (mg/kg) dry weight basis, unless otherwise noted.
[2] Concentrations in micrograms per liter (µg/L).
[3] Permit-specified levels from RCRA permit in milligrams per kilogram (mg/kg).

Table 6. Summary of Detected Analytes for BN/AE Compounds for Building 46 Incinerator Soil Samples. Monsanto Company; Nitro, West Virginia.

		Sample Identification and Date Collected										
Compound	Permit-Specified Levels	1S 5/9/92	1D 5/6/92	2S 5/6/92	2D 5/6/92	3S 5/6/92	3D 5/6/92	4S 5/6/92	4D 5/7/92	5S 5/6/92	5D 5/7/92	6S 5/6/92
Benzo(b)fluoranthene	0.02	0.02 U	0.1 †	1.2 †	0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.05 †	0.24 †
Benzo(a)pyrene	0.02	0.02 U	0.1 †	0.8 †	0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.04 †	0.04 †
Dimethyl phthalate	1000	8	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Phenanthrene	0.9	0.3 U	0.3 U	1.2 †	0.3 U	0.3 U	0.3 U	0.05	0.3 U	2 †	0.3 U	0.54
Fluoranthene	100	0.3 U	0.3 U	1.5	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	2.1	0.3 U	0.4
Pyrene	500	0.3 U	0.3 U	1.1	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5	0.3 U	0.3
Benzo(a)anthracene	0.1	0.009 U	0.009 U	0.6 †	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U
Chrysene	0.1	0.02 U	0.02 U	0.6 †	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Bis(2-ethylhexyl)phthalate	1	0.3 U	0.3 U	0.3 U	0.3 U	0.05	0.3 U	0.086 U	0.3 U	0.3 U	0.07	0.3
2,4,6-Trichlorophenol	0.9	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.2	0.6 U
Anthracene[2]	--	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U
Benzo(k)fluoranthene	2	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U

Sample concentrations for non-target compounds are estimates.
All sample concentrations are reported in milligrams per kilogram (mg/kg) on a dry weight basis.
Results for method blanks, field blank, and trip blank were not detected except for 4-hydroxyl-4-methyl-2-pentanone.
-- = Not available.
†Results exceed permit-specified levels.
* Sample 7S Dup is designated 10S in VI Report.

Table 6. Summary of Detected Analytes for BN/AE Compounds for Building 46 Incinerator Soil Samples. Monsanto Company; Nitro, West Virginia.

Compound	Permit-Specified Levels	Sample Identification and Date Collected										
		6D 5/6/92	7S 5/7/92	7S DUP* 5/7/92	7D 5/7/92	8S 5/6/92	8D 5/6/92	9S 5/7/92	9D 5/7/92	10S 8/25/94	10D 8/25/94	10M 8/25/94
Benzo(b)fluoranthene	0.02	0.02 U	0.02 U	0.6 †	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.19 †	0.16 U	0.16 U
Benzo(a)pyrene	0.02	0.02 U	0.02 U	0.04 †	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.18 †	0.16 U	0.16 U
Dimethyl phthalate	1000	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.16 U	0.16 U	0.16 U
Phenanthrene	0.9	0.7	0.3 U	0.7	0.3 U	0.07	0.3 U	0.3 U	0.3 U	0.66	0.16 U	0.16 U
Fluoranthene	100	0.3 U	0.2	0.7	0.3 U	0.05	0.3 U	0.3 U	0.3 U	0.74	0.16 U	0.16 U
Pyrene	500	0.3 U	0.3 U	0.05	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.52	0.16 U	0.16 U
Benzo(a)anthracene	0.1	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.26 †	0.16 U	0.16 U
Chrysene	0.1	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.22 †	0.16 U	0.16 U
Bis(2-ethylhexyl)phthalate	1	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.5	0.3 U	0.3 U	0.16 U	0.16 U	0.16 U
2,4,6-Trichlorophenol	0.9	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.16 U	0.16 U	0.16 U
Anthracene[2]	--	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.17	0.16 U	0.16 U
Benzo(k)fluoranthene	2	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.18	0.16 U	0.16 U

Sample concentrations for non-target compounds are estimates.
All sample concentrations are reported in milligrams per kilogram (mg/kg) on a dry weight basis.
Results for method blanks, field blank, and trip blank were not detected except for 4-hydroxyl-4-methyl-2-pentanone.
-- = Not available.
†Results exceed permit-specified levels.
* Sample 7S Dup is designated 10S in VI Report.

Table 7. Summary of Riverbank Soil Sample Results. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[1]	Sample Identification and Date Collected		
		RB-1 8/24/94	RB-2 8/24/94	RB-3 8/24/94
Methylene chloride	2	0.007	0.005 U	0.006
Toluene	1,000	0.016	0.005 U	0.01
2-Butanone	1,000	0.1 U	0.1 U	0.1 U
2,4,5-Trichlorophenol	1,000	0.82 U	0.82 U	0.39 J
N-Nitrosodiphenylamine	2	0.16 U	0.16 U	0.53
Phenanthrene	0.9	0.16 U	0.16 U	0.32
Fluoranthene	100	0.43	0.16 U	0.43
Pyrene	500	0.36	0.16 U	0.34
Benzo(a)anthracene	0.1	0.21 †	0.16 U	0.18 †
Chrysene	0.1	0.29 †	0.16 U	0.22 †
Bis(2-ethylhexyl)phthalate	1	0.39	0.16 U	0.82
Benzo(b)fluoranthene	0.02	0.25 †	0.16 U	0.23 †
Benzo(k)fluoranthene	2	0.18	0.16 U	0.16 U
Benzo(a)pyrene	0.02	0.18 †	0.16 U	0.16 U
Indeno(1,2,3-cd)pyrene	0.09	0.18 †	0.16 U	0.16 U
Benzo(g,h,i)perylene	--	0.25	0.16 U	0.16 U
Arsenic	0.5	7.8 †	3.4 †	8.6 †
Barium	1,000	250	110	150
Beryllium	0.2	0.9 †	0.9 †	1.1 †
Cadmium	40	0.6	1.1	0.9
Chromium	400	11	15	15
Copper	--	19	17	29
Lead	--	34	37	73
Mercury	20	0.25 U	0.5	0.9
Nickel	1,000	13	15	19
Selenium	200	0.5	0.2 U	0.7
Zinc	--	83	140	180

-- = Not available.
Concentrations in milligrams per kilogram (mg/kg) dry weight basis, unless otherwise noted.
[1]Permit-specified number from RCRA permit in milligrams per kilogram (mg/kg).
† = Results exceed permit-specified levels.

Table 8. Summary of Sediment Sample Results. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[1]	Sample Identification and Date Collected			
		SED-1 8/25/94	SED-2 8/25/94	SED-3 8/25/94	SED-4 (DUP of SED-1) 8/25/94
N-Nitrosodiphenylamine	2	0.16 U	0.16 U	0.21	0.16 U
Bis(2-ethylhexyl)phthalate	1	0.16 U	0.16 U	4.4 †	0.16 U
Arsenic	0.5	0.6 †	0.8 †	8.2 †	0.6 †
Barium	1,000	16	16	51	24
Beryllium	0.2	0.5 U	0.5 U	0.6 †	0.5 U
Cadmium	40	0.5 U	0.5 U	2.1	0.5 U
Chromium	400	1	1	15	1
Copper	--	2	2	32	2
Lead	--	5 U	5 U	25	5 U
Mercury	20	0.25 U	0.25 U	0.25 U	0.25 U
Nickel	1,000	2 U	3	290	2
Selenium	200	0.2 U	0.2 U	0.2	0.2
Zinc	--	5.4	6.7	120	6.2

Concentrations in milligrams per kilogram (mg/kg) dry weight basis, unless otherwise noted.
[1]Permit-specified levels from RCRA permit in milligrams per kilogram (mg/kg).
† = Results exceed permit-specified level.

Table 9. **Summary of Detected Analytes for Surface Water Sample Results. Monsanto Company; Nitro, West Virginia.**

		Sample Identification and Date Collected			
Parameter	**Permit-Specified Levels**	**SW-1 9/24/94**	**SW-2 9/24/94**	**SW-3 12/13/94**	**SW-4 12/13/94**
Selenium	0.5	0.004	0.004 U	0.004 U	0.004 U
Zinc	--	0.01 U	0.01 B	0.01 U	0.01 U
Barium	1,000	0.02	0.02	0.01	0.03

B = Compound also found in method, trip, or field blank.
U = Not detected above detection level indicated.

Table 10. Summary of Detected VOC Analytes in Ground Water for Process Area. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[1]	Sample Identification and Date Collected											
		MW-1A 9/19/94	MW-1B 9/19/94	MW-2A 9/21/94	MW-2B 9/21/94	MW-3A 9/19/94	MW-3B 9/20/94	MW-4A 9/20/94	MW-4B 9/20/94	MW-5A 9/20/94	MW-5B 9/20/94	MW-6A 9/21/94	MW-6B 9/24/94
Chlorinated Ethenes & Ethanes													
1,1-Dichloroethene	7	5 U	5 U	25 U	5 U	10 †	8 †	6	5 U	25 U	7	5 U	5 U
trans-1,2-Dichloroethene	100	5 U	5 U	25 U	5 U	5 U	5 U	21	5 U	25 U	11	5 U	5 U
Tetrachloroethene	5	5 U	5 U	25 U	5 U	5 U	5 U	5 U	31 †	25 U	5 U	5 U	5 U
Trichloroethene	5	5 U	5 U	120 †	5 U	990 †	77 †	220 †	5 U	880 †	1,050 †	68 †	170 †
cis-1,2-Dichloroethene	--	5 U	5 U	230	5 U	480	54	790	51	170	200	320	37
Vinyl Chloride	10	10 U	10 U	50 U	10 U	10 U	10 U	170 †	69 †	50 U	77 †	550 †	10 U
1,1-Dichloroethane	5	5 U	5 U	25 U	5 U	31 †	23 †	5 U	5 U	25 U	5 U	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	25 U	8 †	5 U	13 †
1,1,2-Trichloroethane	5	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	25 U	7 †	5 U	5 U
Aromatics													
Benzene	5	5 U	5 U	25 U	5 U	8 †	5 U	11 †	5 U	25 U	16 †	18 †	27 †
Ethylbenzene	4,000	5 U	5 U	110	5 U	7	5 U	5 U	5 U	25 U	5 U	67	5 U
Toluene	2,000	5 U	5 U	27	5 U	6	5 U	5 U	5 U	25 U	5 U	130	5 U
Xylenes (total)	10,000	5 U	5 U	300	5 U	22	5 U	5 U	5 U	25 U	5 U	250	5 U
Chlorinated Methanes													
Methylene Chloride	5	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U
Chloroform	6	10 †	5 U	25 U	16 †	32 †	7 †	5 U	7 †	25 U	23 †	5 U	37 †
Carbon Tetrachloride	5	5 U	5 U	25 U	5 U	18 †	5 U	5 U	5 U	25 U	37 †	5 U	10 †
Chlorinated Benzenes													
Chlorobenzene	100	5 U	5 U	80	5 U	240 †	8	37	5 U	25 U	84	5 U	17
Acetones/Ketones													
Acetone	4,000	100 U	100 U	500 U	100 U	100 U	100 U	100 U	100 U	500 U	100 U	100 U	100 U
2-Butanone	2,000	100 U	100 U	500 U	100 U	100 U	100 U	100 U	100 U	500 U	100 U	100 U	100 U
4-Methyl-2-Pentanone	2,000	10 U	10 U	50 U	10 U	10 U	10 U	10 U	10 U	50 U	10 U	54	10 U
Miscellaneous													
Carbon Disulfide	4,000	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	25 U	5 U	5 U	5 U	5 U	5 U	25 U	5 U	5 U	11 †

-- = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.
[1]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.
[1]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 10. Summary of Detected VOC Analytes in Ground Water for Process Area. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[1]	Sample Identification and Date Collected											
		MW-7 9/24/94	MW-8 9/24/94	MW-11A 9/23/94	MW-11B 9/23/94	MW-14 9/24/94	MW-15 9/24/94	MW-17A 9/21/94	MW-17B 9/21/94	MW-18A 9/21/94	MW-18B 9/21/94	MW-19A 9/20/94	MW-19A Dup 9/20/94
Chlorinated Ethenes & Ethanes													
1,1-Dichloroethene	7	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	53 †	5 U	5 U	5 U
trans-1,2-Dichloroethylene	100	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5	250 U	500 †	5 U	5 U	81 †	5 U	5 U	5 U	55 †	7 †	140 †	160 †
cis-1,2-Dichloroethene[1]	–	6,800 K	140	5 U	5 U	5 U	5 U	5 U	5 U	91	6	130	170
Vinyl Chloride	10	500 U	320 †	10 U	10 U	10 U	10 U	10 U	10 U	57 †	10 U	29 †	37 †
1,1-Dichloroethane	5	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	170 †	5 U	5	5
1,2-Dichloroethane	5	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Aromatics													
Benzene	5	3,000 K†	420 †	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	4,000	250 U	10	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	2,000	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	10,000	1,700 K	130	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorinated Methanes													
Methylene Chloride	5	250 U	7 †	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	6	250 U	14 †	5 U	17 †	5 U	5 U	5 U	5 U	11 †	23 †	5 U	5 U
Carbon Tetrachloride	5	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorinated Benzenes													
Chlorobenzene	100	250 U	32	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	15	17
Acetones/Ketones													
Acetone	4,000	5,000 U	100 U	100 U	110	100 U	100 U	110	100 U	100 U	100 U	100 U	100 U
2-Butanone	2,000	5,000 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Methyl-2-Pentanone	2,000	500 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous													
Carbon Disulfide	4,000	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1,000	5 U	5 U
1,2-Dichloropropane	5	250 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

– = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.
[1]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 10. Summary of Detected VOC Analytes in Ground Water for Process Area. Monsanto Company; Nitro, West Virginia.

		Sample Identification and Date Collected							
Parameter	Permit-Specified Levels[1]	MW-19B 9/19/94	MW-20A 9/20/94	MW-20B 9/20/94	MW-21A 9/20/94	MW-21B 9/20/94	MW-22R 9/21/94	MW-23A 9/19/94	MW-24A 9/21/94
Chlorinated Ethenes & Ethanes									
1,1-Dichloroethene	7	5 U	25 U	25 U	5 UJ	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethylene	100	5 U	170 †	25 U	51	6	6	13	5 U
Tetrachloroethene	5	5 U	25 U	25 U	5 U	5 U	5 U	5 U	5
Trichloroethene	5	21 †	3,200 †	2,300 †	470 J†	460 †	21 †	1,300 †	450 †
cis-1,2-Dichloroethene[1]	–	11	830	260	1,800 J	320	84	170	120
Vinyl Chloride	10	10 U	300 †	45 †	130 J†	14 †	110 †	10 U	25 †
1,1-Dichloroethane	5	5 U	25 U	25 U	5 UJ	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5	5 U	25 U	25 U	5 UJ	6 †	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	25 U	25 U	5 UJ	5 U	5 U	5 U	5 U
Aromatics									
Benzene	5	5 U	6 †	25 U	5 UJ	5 U	20 †	7 †	590 †
Ethylbenzene	4,000	5 U	25 U	25 U	5 U	5 U	44	5 U	5 U
Toluene	2,000	5 U	25 U	25 U	5	5 U	5 U	5 U	270
Xylenes (total)	10,000	5 U	25 U	25 U	5 UJ	5 U	26	5 U	5 U
Chlorinated Methanes									
Methylene Chloride	5	5 U	25 U	25 U	5 U	5 U	5 U	5 U	5 U
Chloroform	6	6 †	25 U	25 U	5 UJ	19 †	5 U	81 †	5 U
Carbon Tetrachloride	5	5 U	25 U	25 U	5 UJ	5 U	5 U	250 †	5 U
Chlorinated Benzenes									
Chlorobenzene	100	5 U	25 U	25 U	15	5 U	5	5 U	47
Acetones/Ketones									
Acetone	4,000	100 U	500 U	500 U	100 UJ	100 U	100 U	100 U	100 U
2-Butanone	2,000	100 U	500 U	500 U	100 UJ	100 U	100 U	100 U	110
4-Methyl-2-Pentanone	2,000	10 U	50 U	50 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous									
Carbon Disulfide	4,000	5 U	25 U	25 U	5 UJ	5 U	6	5 U	5 U
1,2-Dichloropropane	5	5 U	25 U	25 U	5 U	5 U	5 U	5 U	5 U

– = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.
[1]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 11. Summary of Detected BN/AE Analytes for Process Area Ground-Water Sample Results. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[a]	Sample Identification and Date Collected											
		MW-1A 9/19/94	MW-1B 9/19/91	MW-2A 9/21/94	MW-2B 9/21/94	MW-3A 9/19/94	MW-3B 9/19/94	MW-4A 9/20/94	MW-4B 9/20/94	MW-5A 9/20/94	MW-5B 9/20/94	MW-6A 9/21/94	MW-6B 9/21/94
Phthalates													
Bis (2-ethylhexyl) phthalate	10	10 U	19 †	10 U	13 †	12 †	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	600	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenols													
2,4-Dichlorophenol	100	10 U	10 U	14 J	10 U	10 UR	10 U	10 UR	10 U	10 UR	10 U	10 UR	10 U
Pentachlorophenol	200	50 U	50 U	50 U	50 U	50 UR	50 U	50 UR	50 U	50 UR	50 U	50 UR	50 U
2,4,5-Trichlorophenol	4,000	50 U	50 U	110	50 U	200 L	50 U	50 UR	50 U	50 UR	50 U	200 L	50 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 UR	10 U	10 UR	10 U	10 UR	10 U	10 UR	10 U
Polynuclear Aromatic Hydrocarbons													
Naphthalene	10,000	10 U	10 U	11	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	–	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenanthrene	7	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Pyrene	1,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	–	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous													
Bis (2-chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	17 †	10 U	10 U
N-Nitrosodi-n-propylamine	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isophorone	–	10 U	10 U	18	10 U	10 U	10 U	10 U	10 U	10 U	10 U	88	10 U

– = Not available.
Concentrations in micrograms per liter (µg/L).
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[a]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 11. Summary of Detected BN/AE Analytes for Process Area Ground-Water Sample Results. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels²	MW-7 9/24/94	MW-8 9/24/94	MW-11A 9/23/94	MW-11B 9/23/94	MW-14 9/24/94	MW-15 9/24/94	MW-17A 9/21/94	MW-17B 9/21/94	MW-18A 9/21/94	MW-18B 9/21/94	MW-19A 9/20/94	MW-19A Dup 9/20/94
		Sample Identification and Date Collected											
Phthalates													
Bis (2-ethylhexyl) phthalate	10	23 L†	10 U	38 †	11 †	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
Di-n-octylphthalate	600	32 L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
Chlorinated Phenols													
2,4-Dichlorophenol	100	10 U	270 †	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 UR	10 UR
Pentachlorophenol	200	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 UR	50 U	50 UR	50 UR
2,4,5-Trichlorophenol	4,000	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 UR	50 U	50 UR	50 UR
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 UR	10 UR
Polynuclear Aromatic Hydrocarbons													
Naphthalene	10,000	220 L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
2-Methylnaphthalene	--	250 L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
Phenanthrene	7	15 L†	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
Pyrene	1,000	15 L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
Fluorene	--	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
Miscellaneous													
Bis (2-chloroethyl) ether	10	10 UL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
N-Nitrosodi-n-propylamine	10	10 UL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
Isophorone	--	10 UL	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U

-- = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.
²The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 11. Summary of Detected BN/AE Analytes for Process Area Ground-Water Sample Results. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[a]	Sample Identification and Date Collected							
		MW-19B 9/19/94	MW-20A 9/20/94	MW-20B 9/20/94	MW-21A 9/20/94	MW-21B 9/20/94	MW-22R 9/21/94	MW-23A 9/19/94	MW-24A 9/21/94
Phthalates									
Bis (2-ethylhexyl) phthalate	10	10 U	10 U	10 U	23 †	16 †	10 U	10 U	100 U
Di-n-octylphthalate	600	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U
Chlorinated Phenols									
2,4-Dichlorophenol	100	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	410 †
Pentachlorophenol	200	50 U	50 U	50 U	50 U	50 U	50 U	50 UR	500 U
2,4,5-Trichlorophenol	4,000	50 U	50 U	50 U	50 U	50 U	36	50 U	950
2,4,6-Trichlorophenol	10	10 U	10 U	53 †	10 U	10 U	10 U	10 U	100 U
Polynuclear Aromatic Hydrocarbons									
Naphthalene	10,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U
2-Methylnaphthalene	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U
Phenanthrene	7	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U
Pyrene	1,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U
Fluorene	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U
Miscellaneous									
Bis (2-chloroethyl) ether	10	10 U	10 U	10 U	10 U	17 †	10 U	10 U	100 U
N-Nitrosodi-n-propylamine	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U
Isophorone	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U

-- = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.
[a]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
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R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 12. Summary of Detected Metals and Other Target Analytes in Ground Water for Process Area. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[a]	Sample Identification and Date Collected											
		MW-1A 9/19/94	MW-1B 9/19/91	MW-2A 9/21/94	MW-2B 9/21/94	MW-3A 9/19/94	MW-3B 9/19/94	MW-4A 9/20/94	MW-4B 9/20/94	MW-5A 9/20/94	MW-5B 9/20/94	MW-6A 9/21/94	MW-6B 9/24/94
Metals													
Arsenic	0.05	0.013	0.004 U	0.022	0.004 U	0.009	0.004 U	0.005	0.008	0.011	0.004 U	0.28 †	0.007
Barium	5.0	0.12	0.03	0.21	0.09	0.18	1.8	0.18	0.02	0.52	2.1	0.08	0.46
Beryllium	0.003	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cadmium	0.005	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.04	0.23	0.01 U	0.01 U	0.01 U	0.01 U	0.04
Chromium	0.1	0.04	0.02 U	0.03	0.02 U	0.07	0.02 U	0.07	0.02 U	0.06	0.02 U	0.02 U	0.02 U
Copper	–	0.04	0.02 U	0.03	0.02 U	0.06	0.02	0.08	0.02 U	0.05	0.02 U	0.02 U	0.02 U
Lead	0.05	0.03	0.012	0.081 U	0.008	0.029	0.026	0.051 †	0.005 U	0.036	0.005 U	0.005 U	0.005 U
Mercury	0.002	0.0003	0.0002 U	0.0002 U	0.0002 U	0.0004	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	0.7	0.06	0.04 U	0.11	0.04 U	0.12	0.08	0.1	0.05	0.09	0.04 U	0.08	0.06
Selenium	0.05	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.005	0.004 U
Zinc	–	0.17	0.09	0.14	0.06	0.35	0.66	0.62	0.07	0.22	0.05 B	0.04 B	0.14
Inorganics													
Total Organic Carbon	–	1 U	1 U	20	5	2	3	1	21	1	19	310	21
Total Organic Halides	–	0.06	0.03	0.46	0.02	1.8	0.28	0.85	0.23	1.2	1.6	0.14	0.48
pH		6.03	5.62	6.42	6.92	6.21	5.65	6.02	6.55	5.46	6.11	6.88	5.91

– = Not available.
Concentrations in milligrams per liter (mg/L).
† = Results exceed Permit-Specified Levels.
[a]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
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U = Not detected above detection level indicated.

Table 12. Summary of Detected Metals and Other Target Analytes in Ground Water for Process Area. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[1]	Sample Identification and Date Collected											
		MW-7 9/24/94	MW-8 9/24/94	MW-11A 9/23/94	MW-11B 9/23/94	MW-14 9/24/94	MW-15 9/24/94	MW-17A 9/21/94	MW-17B 9/21/94	MW-18A 9/21/94	MW-18B 9/21/94	MW-19A 9/20/94	MW-19A Dup 9/20/94
Metals													
Arsenic	0.05	0.049	0.015	0.008	0.004	0.017	0.015	0.008	0.006	0.016	0.024	0.021	0.018
Barium	5.0	0.44	0.11	0.06	0.04	0.17	0.99	0.86	0.02	0.09	0.09	0.69	0.06
Beryllium	0.003	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 †	0.01 U	0.01 U	0.01 U	0.01 U	0.02 †	0.01 U
Cadmium	0.005	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 †	0.01 U	0.03 †	0.01 U
Chromium	0.1	0.03	0.04	0.02 U	0.02 U	0.30 †	0.20 †	0.02 U	0.02 U	0.02 U	0.02 U	0.25 †	0.02 U
Copper	--	0.05	0.06	0.02 U	0.02 U	0.03	0.20	0.02 U	0.02 U	0.02 U	0.02 U	0.25	0.02 U
Lead	0.05	0.047	0.038	0.012	0.005	0.035	0.20 †	0.076 †	0.005 U	0.005 U	0.016	0.20 †	0.20 †
Mercury	0.002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0003	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0007	0.0007
Nickel	0.7	0.04 U	0.04	0.07	0.04 U	0.05	0.28	0.05	0.04 U	0.09	0.04 U	0.35	0.09
Selenium	0.05	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Zinc	--	0.12	0.14	0.13	0.12	0.10	0.77	0.21	0.05 B	0.38	0.18	0.99	0.24
Inorganics													
Total Organic Carbon	--	31	83	1 U	14	1	2	1 U	5	2	6	1 U	2
Total Organic Halides	--	3.2	1.1	0.02 U	0.02 U	0.07	0.02 U	0.02	0.02 U	0.30	0.02 U	0.34	0.20
pH		--	6.42	5.54	5.65	5.93	6.95	5.58	8.67	5.67	6.15	5.30	--

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Concentrations in milligrams per liter (mg/L).
† = Results exceed Permit-Specified Levels.
[1]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

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U = Not detected above detection level indicated.

Table 12. Summary of Detected Metals and Other Target Analytes in Ground Water for Process Area. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[a]	MW-19B 9/19/94	MW-20A 9/20/94	MW-20B 9/20/94	MW-21A 9/20/94	MW-21B 9/20/94	MW-22R 9/21/94	MW-23A 9/19/94	MW-24A 9/21/94
Metals									
Arsenic	0.05	0.005	0.008	0.005	0.042	0.006	0.015	0.005	0.055 †
Barium	5.0	0.10	0.07	0.10	0.52	0.22	0.11	0.17	1.1
Beryllium	0.003	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cadmium	0.005	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chromium	0.1	0.02 U	0.02 U	0.02 U	0.17 †	0.02 U	0.09	0.03	0.05
Copper	--	0.02 U	0.02 U	0.02 U	0.13	0.02 U	0.07	0.02 U	0.04
Lead	0.05	0.014	0.013	0.007	0.069 †	0.014	0.016	0.005	0.016
Mercury	0.002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	0.7	0.04 U	0.06	0.04	0.17	0.04 U	0.08	0.04	0.04 U
Selenium	0.05	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Zinc	--	0.14	0.08	0.07	0.37	0.12	0.38	0.08	0.13
Inorganics									
Total Organic Carbon	--	3	39	34	32	12	66	1	910
Total Organic Halides	--	0.10	3.6	1.4	1.5	1.4	0.67	1.2	4.7
pH		5.88	6.67	6.95	6.70	6.88	6.92	9.39	6.50

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Concentrations in milligrams per liter (mg/L).
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J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 13. Summary of Detected VOC Analytes in Ground Water for Waste Treatment Area. Monsanto Company; Nitro, West Virginia.

		Sample Identification and Date Collected											
Parameter	**Permit-Specified Levels[a]**	**WT-1 9/24/94**	**WT-2 9/22/94**	**WT-3 9/22/94**	**WT-4A 9/22/94**	**WT-4B 9/22/94**	**WT-5A 9/23/94**	**WT-5B 9/23/94**	**WT-6 9/23/94**	**WT-7A 9/21/94**	**WT-7B 9/21/94**	**WT-7C 9/21/94**	**WT-8A 9/22/94**
Chlorinated Ethenes & Ethanes													
1,1-Dichloroethene	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5	5 U	5 U	9 †	52 †	20 †	5 U	5 U	46 †	5 U	12 †	5 U	6 †
cis-1,2-Dichloroethene	–	5 U	5 U	46	200	130	5 U	5 U	150	5 U	11	5 U	5 U
Vinyl Chloride	10	10 U	10 U	10 U	40 †	70 †	10 U	10 U	10 U	10 U	12 †	10 U	10 U
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Aromatics													
Benzene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 †	74 †	5 U	5 U
Ethylbenzene	4,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	2,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	10,000	5 U	5 U	5 U	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorinated Methanes													
Chloromethane	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	6	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	23 †	5 U	5 U
Methylene Chloride	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorinated Benzenes													
Chlorobenzene	100	5 U	5 U	5 U	19	5 U	5 U	5 U	5 U	190 †	14	5 U	5 U
Acetones/Ketones													
Acetone	4,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Methyl-2-Pentanone	2,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous													
Carbon Disulfide	4,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11	18	5 U
1,2-Dichloropropane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

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Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.
[a]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
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L = Biased low.
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U = Not detected above detection level indicated.

Table 13. Summary of Detected VOC Analytes in Ground Water for Waste Treatment Area. Monsanto Company; Nitro, West Virginia.

		Sample Identification and Date Collected											
Parameter	**Permit-Specified Levels[a]**	**WT-8B 9/22/94**	**WT-8C 9/24/94**	**WT-9A 9/22/94**	**WT-9B 9/22/94**	**WT-9C 9/22/94**	**WT-10A 9/22/94**	**WT-10A Dup 9/22/94**	**WT-10B 9/23/94**	**WT-10C 9/23/94**	**WT-11A 9/22/94**	**WT-11B 9/22/94**	**WT-11C 9/22/94**
Chlorinated Ethenes & Ethanes													
1,1-Dichloroethene	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5	5 U	5 U	540 †	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	5	5 U	5 U	6 †	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Aromatics													
Benzene	5	5 U	5 U	74 †	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	4,000	5 U	5 U	43	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	2,000	5 U	5 U	37	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	10,000	5 U	5 U	85	5 U	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorinated Methanes													
Chloromethane	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	6	5 U	5 U	41 †	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorinated Benzenes													
Chlorobenzene	100	5 U	5 U	1,100 †	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetones/Ketones													
Acetone	4,000	100 U	100 U	590	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Methyl-2-Pentanone	2,000	10 U	10 U	43	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous													
Carbon Disulfide	4,000	5 U	5 U	130	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	10 †	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

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Table 13. **Summary of Detected VOC Analytes in Ground Water for Waste Treatment Area. Monsanto Company; Nitro, West Virginia.**

		Sample Identification and Date Collected								
Parameter	**Permit-Specified Levels²**	**WT-13A 9/23/94**	**WT-14A 9/24/94**	**WT-15A 9/23/94**	**TB-1 9/23/94**	**TB-3 9/23/94**	**TD-1 9/24/94**	**TD-3 9/23/94**	**TD-5 9/23/94**	**TD-5 Dup 9/23/94**
Chlorinated Ethenes & Ethanes										
1,1-Dichloroethene	7	5 U	25 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5	610 †	25 U	13 †	5 U	5 U	15 †	7 †	7 †	7 †
cis-1,2-Dichloroethene	--	17	5 U	5 U	5 U	5 U	5 U	5 U	6	6
Vinyl Chloride	10	10 U	50 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	5	5 U	25 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Aromatics										
Benzene	5	5 U	2,600 †	12 †	6 †	60 †	6 †	41 †	5 U	5 U
Ethylbenzene	4,000	5 U	25 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	2,000	5 U	420	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	10,000	5 U	110	6	5 U	5 U	10	5 U	5 U	5 U
Chlorinated Methanes										
Chloromethane	10	10 U	600 †	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	6	5 U	25 U	5 U	5 U	31 †	14 †	5 U	5 U	5 U
Methylene Chloride	5	5 U	170 †	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorinated Benzenes										
Chlorobenzene	100	11	31	5 U	5 U	50	16	990 †	9	8
Acetones/Ketones										
Acetone	4,000	100 U	890	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Methyl-2-Pentanone	2,000	10 U	50 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Miscellaneous										
Carbon Disulfide	4,000	5 U	25 U	5 U	5 U	5 U	5 U	10	5 U	5 U
1,2-Dichloropropane	5	5 U	25 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

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Concentrations in micrograms per liter (µg/L).
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²The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

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J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 14. Summary of Detected BN/AE Analytes in Ground Water for Waste Treatment Area. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[2]	Sample Identification and Date Collected											
		WT-1 9/24/94	WT-2 9/22/94	WT-3 9/22/94	WT-4A 9/22/94	WT-4B 9/22/94	WT-5A 9/23/94	WT-5B 9/23/94	WT-6 9/23/94	WT-7A 9/21/94	WT-7B 9/21/94	WT-7C 9/21/94	WT-8A 9/22/94
Phenols													
2,4,5-Trichlorophenol	4,000	50 U	50 U	50 UR	50 UR	50 UR	50 UR	50 UR	50 U	50 UR	50 UR	50 U	50 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 UR	10 UR	10 UR	10 UR	10 UR	10 U	10 UR	10 UR	10 U	10 U
2,4-Dichlorophenol	100	10 U	10 U	10 UR	10 UR	10 UR	10 UR	10 UR	10 U	10 UR	10 UR	10 U	10 U
4-Chloro-3-methylphenol	200	10 U	10 U	10 UR	10 UR	10 UR	10 UR	10 UR	10 U	10 UR	10 UR	10 U	10 U
2,4-Dimethylphenol	20	10 U	10 U	10 UR	10 UR	10 UR	10 UR	10 UR	10 U	10 UR	10 UR	10 U	10 U
2-Methylphenol	2,000	10 U	10 U	10 UR	10 UR	10 UR	10 UR	10 UR	10 U	10 UR	10 UR	10 U	10 U
3- and 4-Methylphenol	2,000	53	10 U	10 UR	10 UR	10 UR	10 UR	10 UR	10 U	10 UR	10 UR	10 U	10 U
Phenol	20,000	10 U	10 U	10 UR	10 UR	10 UR	10 UR	10 UR	10 U	10 UR	10 UR	10 U	10 U
NitroPhenols													
4-Nitrophenol	--	50 U	50 U	50 UR	50 UR	50 UR	50 UR	50 UR	50 U	41 L	50 UR	50 U	50 U
2-Nitrophenol	--	10 U	10 U	10 UR	10 UR	10 UR	10 UR	10 UR	10 U	10 UR	10 UR	10 U	10 U
4,6-Dinitro-2-methylphenol	--	50 U	50 U	50 UR	50 UR	50 UR	50 UR	50 UR	50 U	50 UR	50 UR	50 U	50 U
Miscellaneous													
N-Nitrosodi-n-propylamine	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isophorone[1]	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

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Concentrations in micrograms per liter (µg/L).
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[2]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
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K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 14. Summary of Detected BN/AE Analytes in Ground Water for Waste Treatment Area. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[2]	WT-8B 9/22/94	WT-8C 9/24/94	WT-9A 9/22/94	WT-9B 9/22/94	WT-9C 9/22/94	WT-10A 9/22/94	WT-10A Dup 9/22/94	WT-10B 9/23/94	WT-10C 9/23/94	WT-11A 9/22/94	WT-11B 9/22/94	WT-11C 9/22/94
Phenols													
2,4,5-Trichlorophenol	4,000	50 U	50 U	37 L	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 UR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	100	10 U	10 U	10 UR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	200	10 U	10 U	10 UR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	20	10 U	15	10 UR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	2,000	10 U	100	10 UR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
3- and 4-Methylphenol	2,000	10 U	10 U	10 UR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenol	20,000	10 U	10 U	10 UR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
NitroPhenols													
4-Nitrophenol	--	50 U	50 U	50 UR	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
2-Nitrophenol	--	10 U	10 U	10 UR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4,6-Dinitro-2-methylphenol	--	50 U	50 U	50 UR	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Miscellaneous													
N-Nitrosodi-n-propylamine	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isophorone[1]	--	10 U	10 U	65	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

-- = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.
[2]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 14. Summary of Detected BN/AE Analytes in Ground Water for Waste Treatment Area. Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels[a]	Sample Identification and Date Collected								
		WT-13A 9/23/94	WT-14A 9/24/94	WT-15A 9/23/94	TB-1 9/23/94	TB-3 9/23/94	TD-1 9/24/94	TD-3 9/23/94	TD-5 9/23/94	TD-5 Dup 9/23/94
Phenols										
2,4,5-Trichlorophenol	4,000	55	50 U	50 U	50 UR	50 UR	17	50 UR	50 UR	50 U
2,4,6-Trichlorophenol	10	10 UR	470 †	10 U	10 UR	10 UR	10 U	10 UR	10 UR	10 U
2,4-Dichlorophenol	100	10 UR	130 †	10 U	10 UR	10 UR	10 U	10 UR	10 UR	10 U
4-Chloro-3-methylphenol	200	10 UR	1,200 †	10 U	10 UR	10 UR	10 U	10 UR	10 UR	10 U
2,4-Dimethylphenol	20	10 UR	3,800 †	10 U	10 UR	10 UR	10 U	10 UR	10 UR	10 U
2-Methylphenol	2,000	10 UR	2,500 †	10 U	10 UR	10 UR	10 U	10 UR	10 UR	10 U
3- and 4-Methylphenol	2,000	10 UR	50,000 †	10 U	10 UR	10 UR	10 U	10 UR	10 UR	10 U
Phenol	20,000	10 UR	5,800	10 U	10 UR	10 UR	10 U	10 UR	10 UR	10 U
NitroPhenols										
4-Nitrophenol	--	50 UR	50 U	50 U	50 UR	50 UR	50 U	50 UR	50 UR	50 U
2-Nitrophenol	--	10 UR	10 U	10 U	10 UR	10 UR	10 U	35 L	10 UR	10 U
4,6-Dinitro-2-methylphenol	--	50 UR	50 U	50 U	50 UR	50 UR	50 U	17 L	50 UR	50 U
Miscellaneous										
N-Nitrosodi-n-propylamine	10	10 U	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isophorone[1]	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

-- = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.
[a]The higher of Permit-Specified Levels or Practical Quantitation Limits from RCRA Permit.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 15. Summary of Detected Metals and Other Target Analytes in Ground Water for Waste Treatment Area . Monsanto Company; Nitro, West Virginia.

Parameter	Permit-Specified Levels	WT-1 9/24/94	WT-2 9/22/94	WT-3 9/22/94	WT-4A 9/22/94	WT-4B 9/22/94	WT-5A 9/23/94	WT-5B 9/23/94	WT-6 9/23/94	WT-7A 9/21/94	WT-7B 9/21/94	WT-7C 9/21/94	WT-8A 9/22/94
		Sample Identification and Date Collected											
Metals													
Arsenic	0.05	0.02	0.008	0.01	0.007	0.01	0.004	0.004	0.011	0.004 U	0.004 U	0.004 U	0.004 U
Barium	5.0	0.20	0.55	0.12	0.05	0.03	0.13	0.10	0.49	0.11	0.05	0.51	0.13
Beryllium	0.003	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cadmium	0.005	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chromium	0.1	0.07	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.03	0.02 U	0.02 U	0.02 U	0.02 U
Copper	–	0.1	0.02 U	0.02 U	0.13	0.02 U	0.02 U	0.02 U	0.04	0.02 U	0.02 U	0.02 U	0.04
Lead	0.05	0.11	0.017	0.011	0.021	0.005 U	0.005 U	0.005 U	0.067 †	0.005	0.005 U	0.005 U	0.039
Mercury	0.002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	0.7	0.17	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.05	0.04	0.04 U	0.04 U	0.04 U
Selenium	0.05	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Zinc	--	0.25	0.07 B	0.07 B	0.12 B	0.04 B	0.04	0.11	0.16	0.06	0.07	0.01 B	0.09
Inorganics													
Total Organic Carbon	–	1 U	1 U	1 U	15	10	3	5	10	16	18	1 U	6
Total Organic Halides	–	0.02	0.02	0.17	0.31	0.06	0.05	0.06	0.31	0.02 U	0.02 U	0.05	0.1
pH		6.22	5.22	5.56	5.28	5.75	5.81	5.79	6.25	5.95	5.81	8.78	6.98

-- = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 15. Summary of Detected Metals and Other Target Analytes in Ground Water for Waste Treatment Area . Monsanto Company; Nitro, West Virginia.

		Sample Identification and Date Collected											
Parameter	Permit-Specified Levels	WT-8B 9/22/94	WT-8C 9/24/94	WT-9A 9/22/94	WT-9B 9/22/94	WT-9C 9/22/94	WT-10A 9/22/94	WT-10A Dup 9/22/94	WT-10B 9/23/94	WT-10C 9/23/94	WT-11A 9/22/94	WT-11B 9/22/94	WT-11C 9/22/94
Metals													
Arsenic	0.05	0.025	0.009	0.008	0.008	0.004 U	0.01	0.005	0.004 U	0.006	0.004 U	0.024	0.004 U
Barium	5.0	0.76	0.35	0.13	0.16	0.11	0.19	0.12	0.17	0.33	0.09	0.50	0.15
Beryllium	0.003	0.01	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cadmium	0.005	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chromium	0.1	0.12 †	0.02 U	0.04	0.02 U	0.02 U	0.05	0.02 U	0.02 U	0.02 U	0.02 U	0.13 †	0.02 U
Copper	--	0.16	0.02 U	0.03	0.02 U	0.02 U	0.04	0.02 U	0.02 U	0.02 U	0.02 U	0.20	0.02 U
Lead	0.05	0.19 †	0.038	0.027	0.005	0.005 U	0.032	0.01	0.005 U	0.005 U	0.015	0.20 †	0.008
Mercury	0.002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0003	0.0002 U
Nickel	0.7	0.12	0.04 U	0.05	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.19	0.04 U
Selenium	0.05	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Zinc	--	0.55	0.05	0.2	0.03	0.02	0.17	0.05	0.01	0.02	0.06	0.76	0.03
Inorganics													
Total Organic Carbon	--	5	2	14	1 U	3	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Organic Halides	--	0.04	0.02 U	3.7	0.03	0.04	0.03	0.04	0.02 U	0.02 U	0.02 U	0.04	0.02 U
pH		8.72	8.24	5.42	6.76	9.27	5.95	--	6.91	7.80	8.03	8.02	9.71

-- = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

Table 15. Summary of Detected Metals and Other Target Analytes in Ground Water for Waste Treatment Area. Monsanto Company; Nitro, West Virginia.

		Sample Identification and Date Collected								
Parameter	Permit-Specified Levels	WT-13A 9/23/94	WT-14A 9/24/94	WT-15A 9/23/94	TB-1 9/23/94	TB-3 9/23/94	TD-1 9/24/94	TD-3 9/23/94	TD-5 9/23/94	TD-5 Dup 9/23/94
Metals										
Arsenic	0.05	0.005	0.017	0.007	0.004 U	0.004 U	0.004 U	0.004 U	0.005	0.006
Barium	5.0	0.16	0.74	0.05	0.35	1.9	0.04	0.28	0.11	0.54
Beryllium	0.003	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Cadmium	0.005	0.01 U	0.01 U	0.01 U	0.28 †	0.08 †	0.01 U	0.03 †	0.01 U	0.01 U
Chromium	0.1	0.04	0.05	0.02 U	0.02 U	0.02 U	0.03	0.02 U	0.02 U	0.02 U
Copper	–	0.07	190	0.02 U	0.09	0.04	0.02 U	0.02 U	0.02 U	0.02 U
Lead	0.05	0.008	0.080 †	0.011	0.051 †	0.022	0.017	0.006	0.013	0.017
Mercury	0.002	0.0002 U	0.0075	0.0002 U	0.0007	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	0.7	0.17	0.04 U	0.04 U	0.04 U	0.38	0.04 U	0.20	0.07	0.07
Selenium	0.05	0.004 U	0.005	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Zinc	–	1.1	0.09	0.05	0.08	0.66	0.07	0.24	0.41	0.37
Inorganics										
Total Organic Carbon	–	12	260	11	29	11	10	30	20	21
Total Organic Halides	–	1.3	3.9	1.1	0.43	0.25	0.27	0.66	0.57	0.54
pH		5.35	8.26	5.93	7.12	5.30	6.29	6.09	6.98	--

– = Not available.
Concentrations in micrograms per liter (µg/L).
† = Results exceed Permit-Specified Levels.

B = Compound also found in method, trip, or field blank.
J = Estimated value or detected below detection limit.
K = Biased high.
L = Biased low.
R = Rejected as unusable.
U = Not detected above detection level indicated.

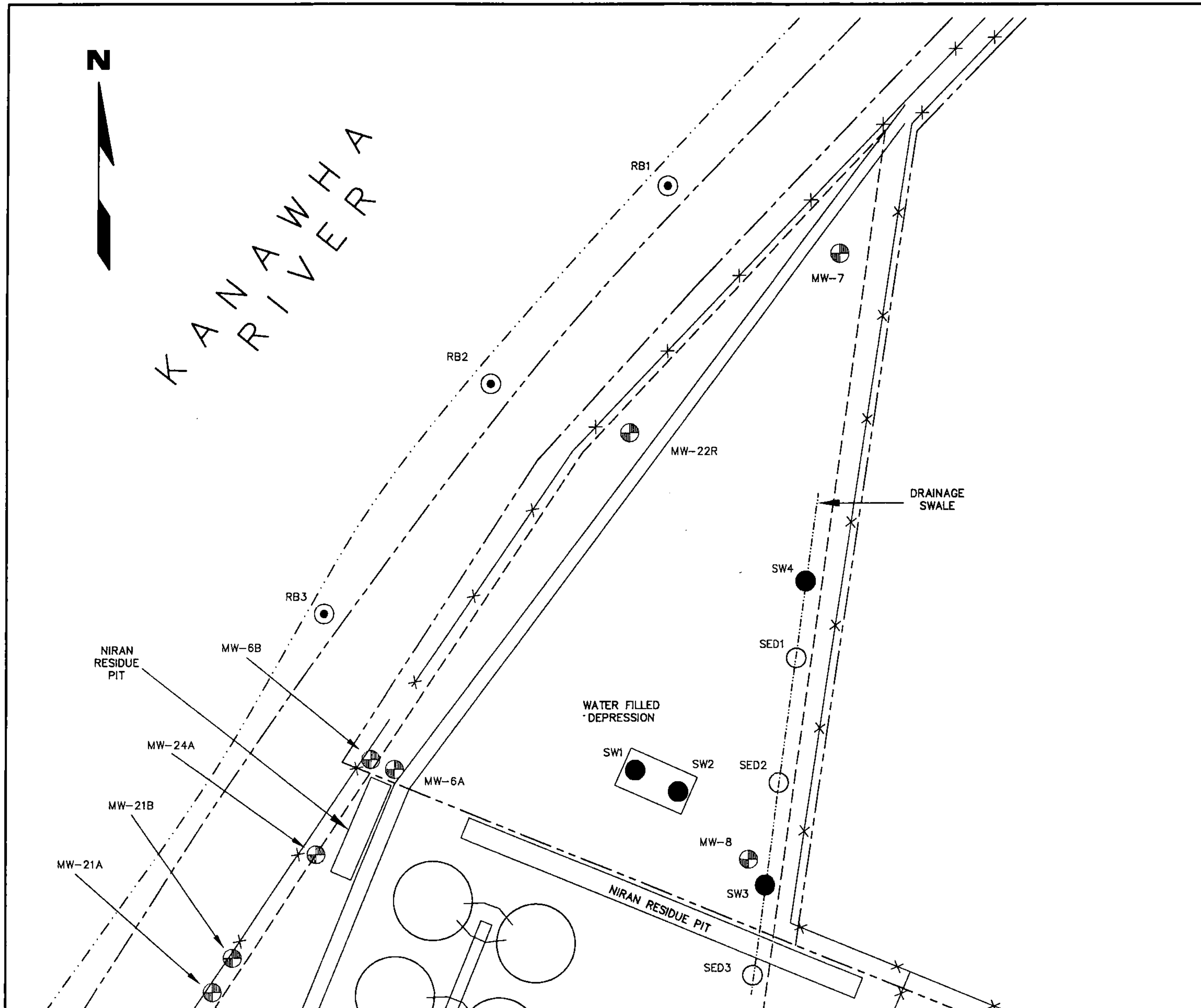
Table 16. Summary of Dissolved-Phase Constituent Occurrence and Frequency in Ground-Water Samples. Monsanto Company; Nitro, West Virginia.

Parameter	Number of Detections: A Wells[2] (Upper Alluvial Deposits)	B Wells[3] (Lower Alluvial Deposits)	C Wells[4] (Bedrock)	Total[1]	Minimum Observed Concentration (μg/ℓ)	Maximum Observed Concentration (μg/ℓ)
<u>Chlorinated</u>						
1,1-Dichloroethene	3	2	--	5	6	53
trans-1,2-Dichloroethene	5	2	--	7	6	170
Tetrachloroethene	1	1	--	2	5	31
Trichloroethene	**24**	**9**	--	**33**	**6**	**3,200**
cis-1,2-Dichloroethene	19	10	--	29	6	6,800K
Vinyl Chloride	10	6	--	16	12	550
1,1-Dichloroethane	3	1	--	4	5	170
1,2-Dichloroethane	1	3	--	4	6	13
1,1,2-Trichloroethane	--	1	--	1	7	7
<u>Aromatics</u>						
Benzene	**17**	**3**	--	**20**	**6**	**3,000K**
Ethylbenzene	6	--	--	6	7	110
Toluene	7	--	--	7	6	420
Total Xylenes	11	--	1	12	5	1,700K
<u>Chlorinated Methanes</u>						
Methylene Chloride	2	--	--	2	7	170
Chloroform	8	10	--	18	6	81
Carbon Tetrachloride	2	2	--	4	10	250
Chloromethane	1	--	--	1	600	600
<u>Chlorinated Benzenes</u>						
Chlorobenzene	17	3	--	20	5	1,100
<u>Acetone/Ketones</u>						
Acetone	3	1	--	4	110	890
2-Butanone (MEK)	1	--	--	1	110	110
4-Methyl-2-Pentanone (MIBK)	2	--	--	2	43	54
<u>Miscellaneous</u>						
Carbon Disulfide	3	2	1	6	6	1,000
1,2-Dichloropropane	1	1	--	2	10	11
Hydrocarbon[5]	1	--	--	1	NS	NS
<u>BN/AE Compounds</u>						
Total Phenol Compounds	**12**	**1**	**1**	**14**	**17**	**63,900**

[1] Number of wells analyte was detected out of 62 total monitoring well samples.
[2] Out of a total of 38 wells.
[3] Out of a total of 19 wells.
[4] Out of a total of 5 wells.
[5] LNAPL observed in MW-7 believed to be kerosene.

-- = Compound not reported above detectable limits.
K = Value reported is biased high.
J = Estimated value or detected below detection limit.
NS = Not sampled.
NOTE: Does not include estimated values or detections below detection limits.

FIGURES



Title:

RIVERBANK SOIL, SURFACE WATER, AND SEDIMENT SAMPLE LOCATIONS

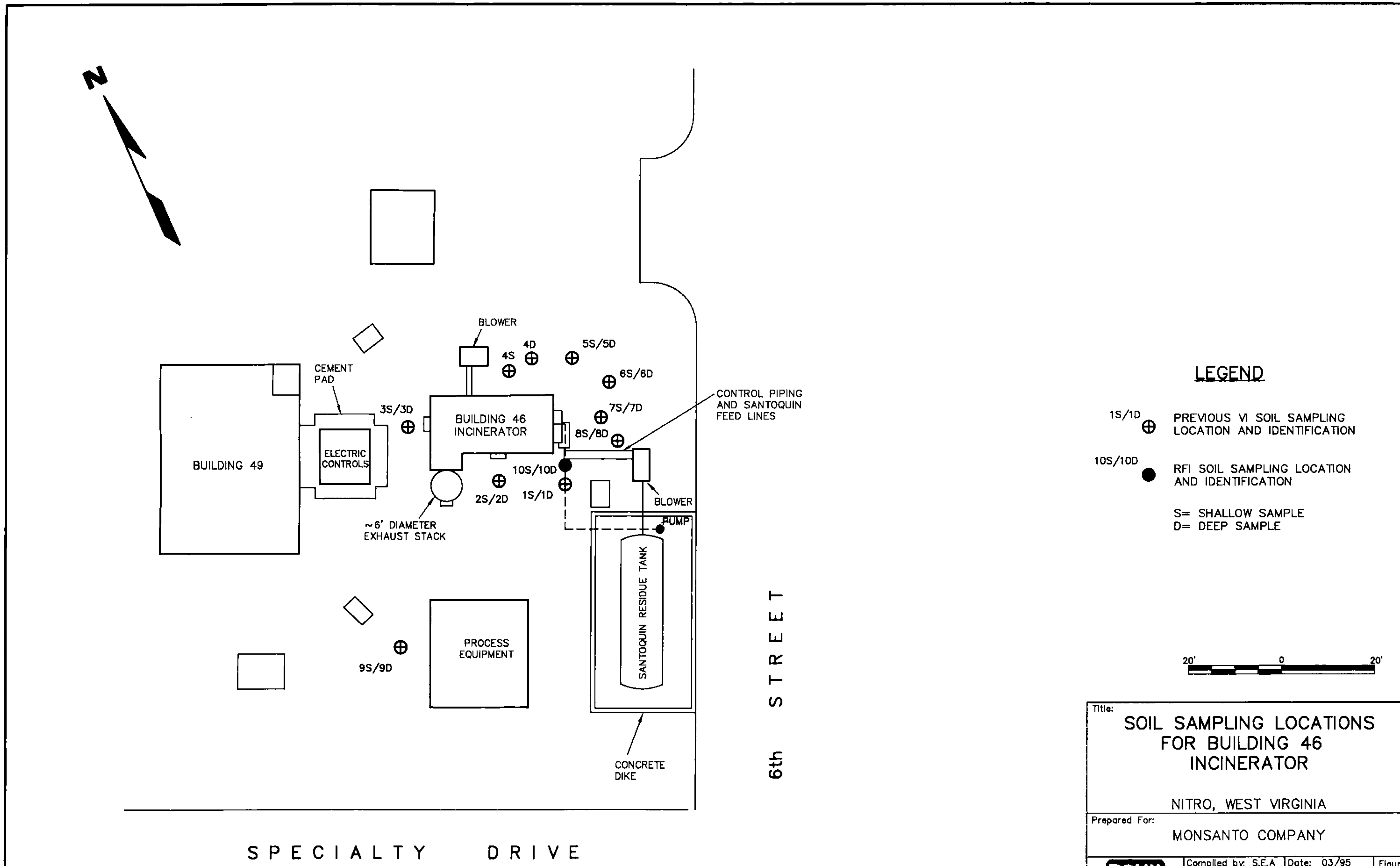
NITRO, WEST VIRGINIA

Prepared For:

MONSANTO COMPANY

ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: J.T.C.	Date: 04/95	Figure
Prepared by: B.R.M.	Scale: SHOWN	2
Project Mgr: J.T.C.	Revision: FINAL	
Proj No: 06619J03	File No: 06619044	



Title:

SOIL SAMPLING LOCATIONS FOR BUILDING 46 INCINERATOR

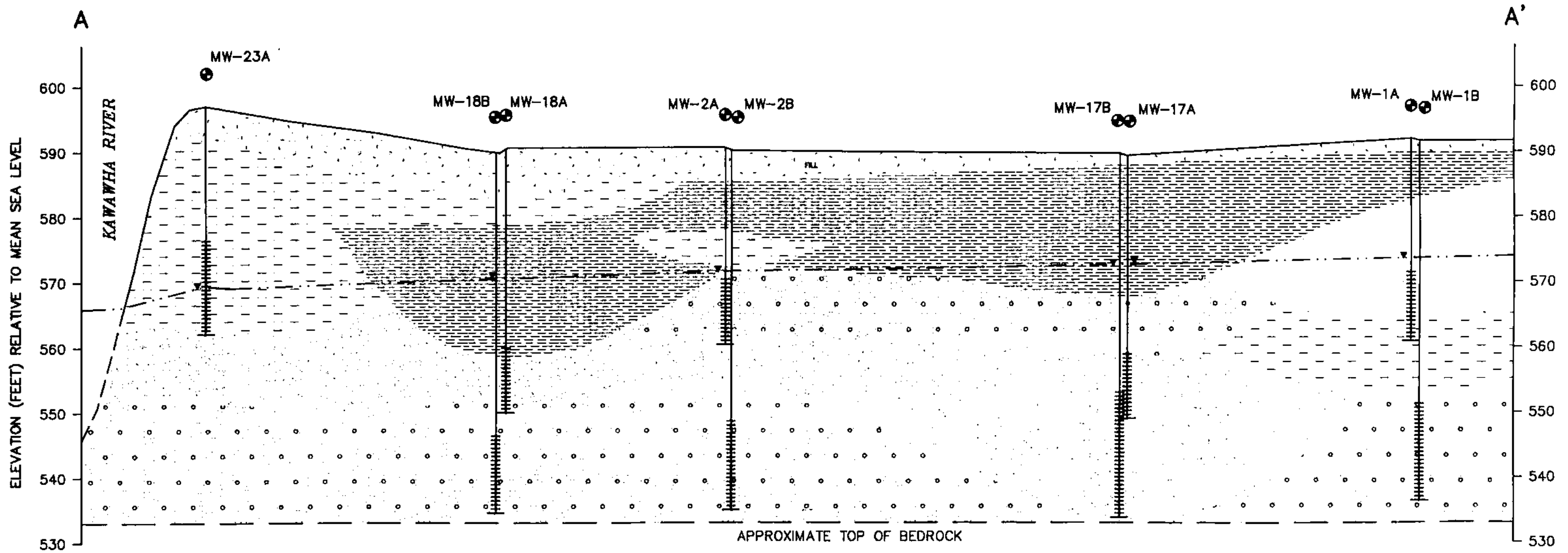
NITRO, WEST VIRGINIA

Prepared For:

MONSANTO COMPANY

ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: S.E.A	Date: 03/95	Figure
Prepared by: M.J.V.	Scale: SHOWN	3
Project Mgr: J.T.C.	Revision: FINAL	
Proj No: 06619J	File No: 06619018	



LEGEND

MW-1A — MONITORING WELL LOCATION AND IDENTIFICATION

WELL CASING

WELL SCREEN

BOTTOM OF WELL

WATER TABLE SURFACE

PREDOMINANT SOIL TYPE LEGEND

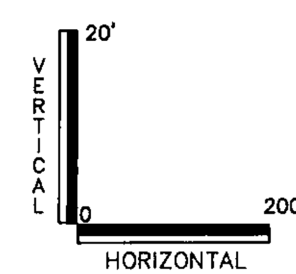
FILL CONTAINING SAND, SILT, AND CLAY

SILT AND CLAY

SILT AND SAND

FINE TO MEDIUM SAND

MEDIUM TO COARSE SAND



Title:

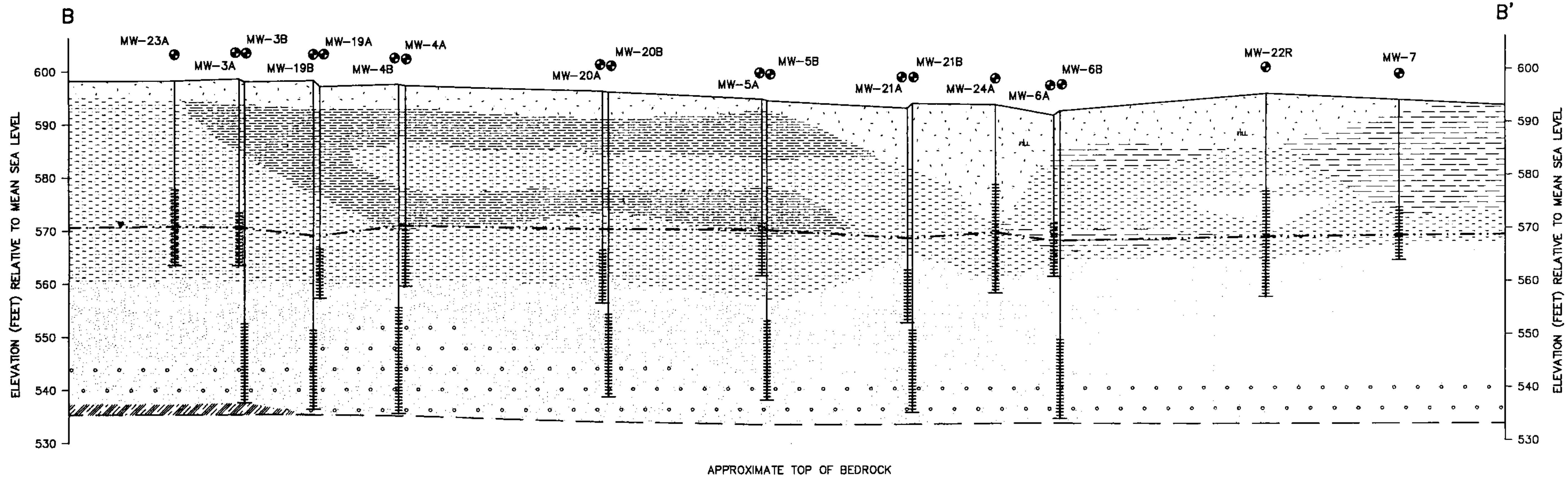
CROSS-SECTION
A – A'

NITRO, WEST VIRGINIA

Prepared For:
MONSANTO COMPANY

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: S.E.A.	Date: 03/94	Figure
Prepared by: B.R.M.	Scale: SHOWN	4
Project Mgr: J.T.C.	Revision: FINAL	
Proj No: 06619J02	File No: 06619025	



LEGEND

MW-1A — MONITORING WELL LOCATION AND IDENTIFICATION

WELL CASING

WELL SCREEN

BOTTOM OF WELL

WATER TABLE SURFACE

PREDOMINANT SOIL TYPE LEGEND

FILL CONTAINING SAND, SILT, AND CLAY

SILT AND CLAY

SILT AND SAND

FINE TO MEDIUM SAND

MEDIUM TO COARSE SAND

CLAY

VERTICAL 0 20'

HORIZONTAL 0 200'

Title:

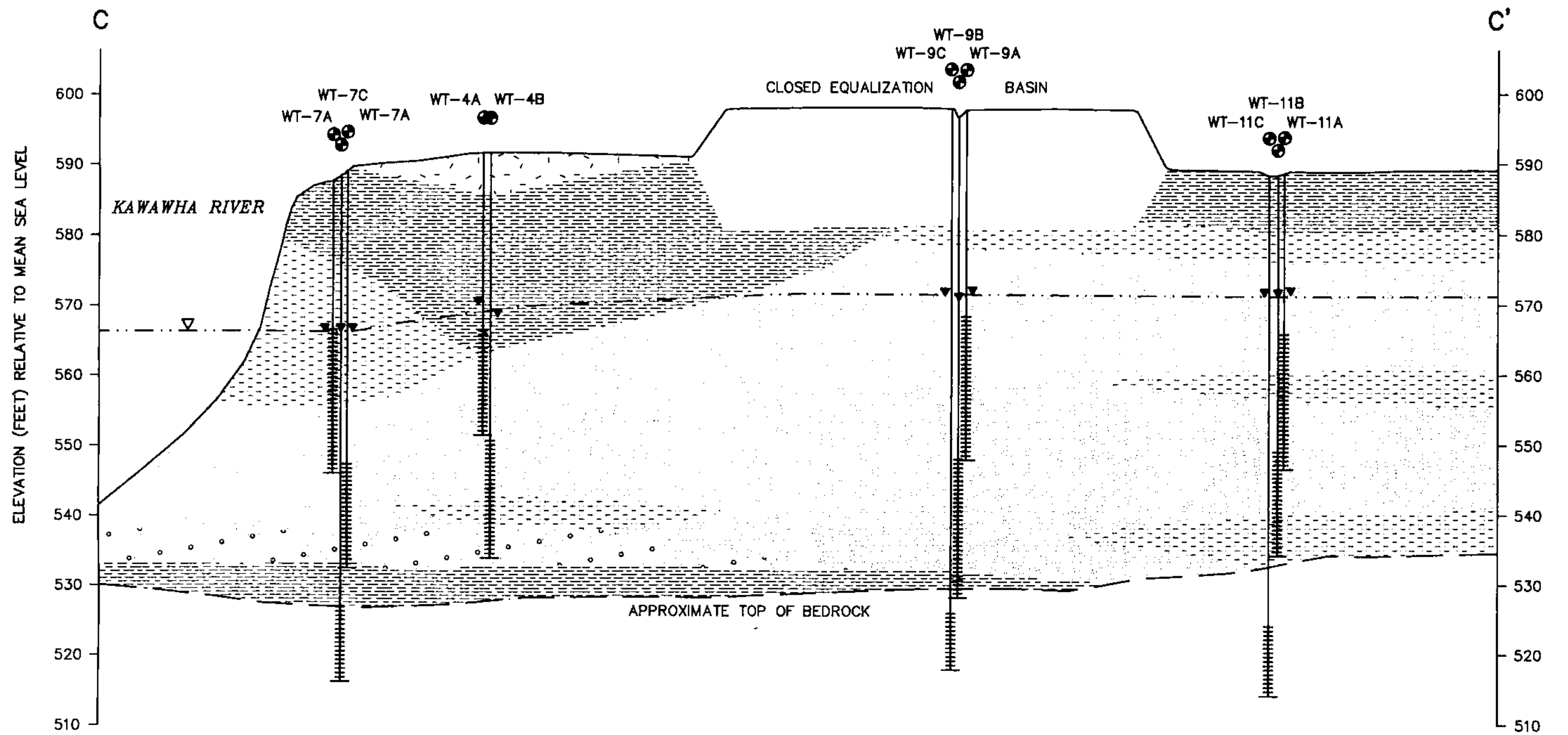
CROSS–SECTION B – B'

NITRO, WEST VIRGINIA

Prepared For: MONSANTO COMPANY

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: S.E.A.	Date: 03/94	Figure
Prepared by: B.R.M.	Scale: SHOWN	5
Project Mgr: J.T.C.	Revision:	
Proj No: 06619J02	File No: 06619027	



LEGEND

WT-4A MONITORING WELL LOCATION AND IDENTIFICATION

WELL CASING

WELL SCREEN

BOTTOM OF WELL

WATER TABLE SURFACE

PREDOMINANT SOIL TYPE LEGEND

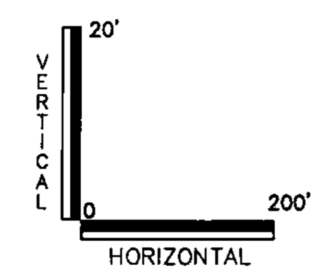
FILL CONTAINING SAND, SILT, AND CLAY

SILT AND CLAY

SILT AND SAND

FINE TO MEDIUM SAND

MEDIUM TO COARSE SAND



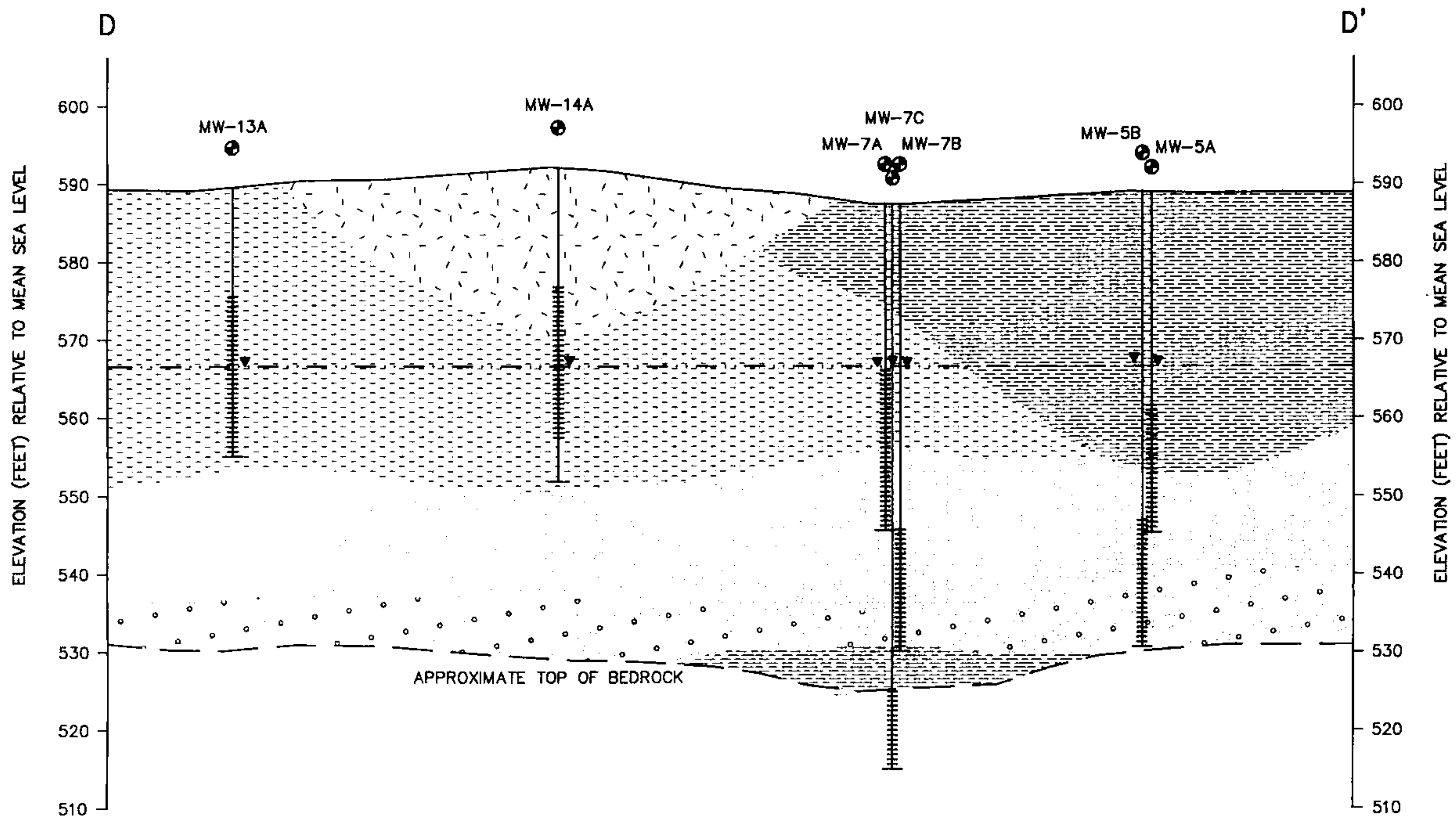
Title:

CROSS-SECTION C – C'

NITRO, WEST VIRGINIA

Prepared For: MONSANTO COMPANY

ROUX ASSOCIATES INC Environmental Consulting & Management	Compiled by: M.S.T.	Date: 03/95	Figure 6
	Prepared by: M.J.V.	Scale: SHOWN	
	Project Mgr: J.T.C.	Revision: FINAL	
	Proj No: 06619J03	File No: 06619026	



LEGEND

MW-5A MONITORING WELL LOCATION AND IDENTIFICATION

WELL CASING

WELL SCREEN

BOTTOM OF WELL

WATER TABLE SURFACE

PREDOMINANT SOIL TYPE LEGEND

FILL CONTAINING SAND, SILT, AND CLAY

SILT AND CLAY

SILT AND SAND

FINE TO MEDIUM SAND

MEDIUM TO COARSE SAND

VERTICAL 20' 0 200' HORIZONTAL

Title:

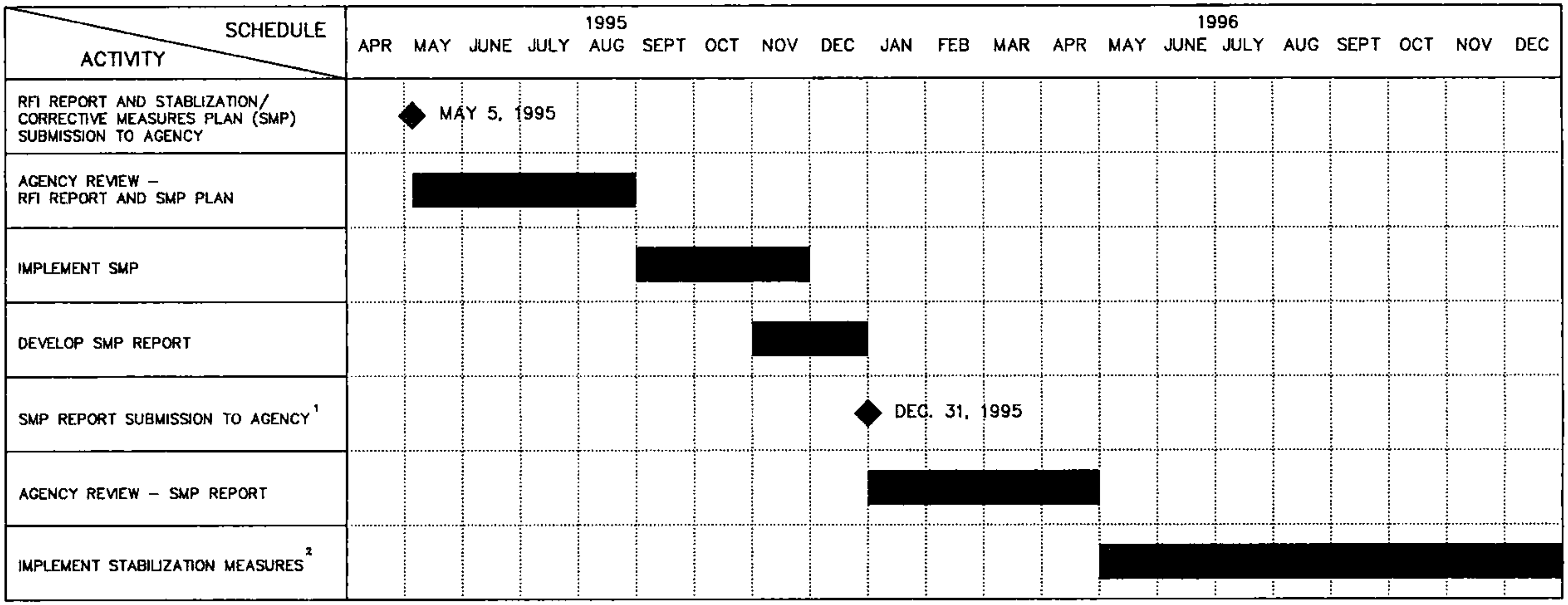
CROSS-SECTION D – D'

NITRO, WEST VIRGINIA

Prepared For: MONSANTO COMPANY

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: S.E.A.	Date: 03/95	Figure
Prepared by: M.J.V.	Scale: SHOWN	7
Project Mgr: J.T.C.	Revision: FINAL	
Proj No: 06619J03	File No: 06619028	



LEGEND

PROJECT ACTIVITY SCHEDULE

PROPOSED MILESTONE

NOTES:

[1] ADDITIONAL TIME FOR REPORT SUBMISSION MAY BE NECESSARY DEPENDING UPON APPROVED SCOPE OF WORK.

[2] DURATION OF STABILIZATION MEASURES CANNOT BE DETERMINED AT THIS TIME.

Title:

PROPOSED PROJECT SCHEDULE

NITRO, WEST VIRGINIA

Prepared For:

MONSANTO COMPANY

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: J.T.C.	Date: 05/95	Figure
Prepared by: B.R.M.	Scale: NONE	8
Project Mgr: J.T.C.	Revision: FINAL	
Proj No: 06619J03	File No: 06619049	

APPENDIX A

GEOLOGIC LOGS

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. MW-22R

Study No. 06619J03 Date 8/26/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 0720 Ended 1630
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 40
Casing Diam. (in.) 4
Casing Interval (ft.) 18-0
Screen Interval (ft.) 38-18
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W. READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	1	12	0-2	3,3,4,8	Silt	0	Moderate orange brown sandy silt with gravel, moist, fill material
25	2	12	2-4	3,3,3,3		2	Dark orange brown silt with gravel, trace sand, sand fraction medium to coarse grained, moist
–	–	–	–	–		4	
38	4	12	6-8	3,2,3,5		6	Same as above
40	5	5	8-10	4,6,7,6		8	Moderate brown to black silt with gravel, gravel is fine to coarse grained (1"), moist, wood and brick present, odor present
75	6	10	10-12	6,6,4,5		10	Same as above, moist, brick present, odor and black staining present
–	7	18	12-14	3,4,6,5	Sand	12	Moderate orange-brown silty sand, fine grained, dry
–	8	12	14-16	3,4,4,6		14	Light gray sand with silt, medium grained, moist
2	9	20	16-18	3,4,4,4		16	Light gray sand, trace silt, medium grained, moist
0	10	1	18-20	5,7,6,4		18	Moderate orange brown, silty sand, fine grained, moist, slight odor
1	11	6	20-22	3,4,4,5		20	Moderate brown to orange-brown sand, trace silt, medium grained, moist

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. MW-22R

Study No. 06619J03 Date 8/26/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 0720 Ended 1630
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA
Hole Diam. (in.) 12
Final Depth (ft.) 40
Casing Diam. (in.) 4
Casing Interval (ft.) 18-0
Screen Interval (ft.) 38-18
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER
Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
11	12	12	22-24	6,5,5,6	Sand	22	Same as above
11	13	10	24-26	3,4,5,4		24	Moderate yellow brown sand, trace silt, medium to fine grained, moist
–	14	12	26-28	2,2,2,6		26	Yellow brown silty sand, medium to fine grained, moist to wet
–	15	24	28-30	3,2,6,6		28	Yellow brown and light gray silty sand, trace clay, medium to fine grained, wet
0	16	14	30-32	1,1,1,2		30	Moderate orange brown sand with silt, medium grained, wet
0	17	24	32-34	1,1,2,3		32	Moderate yellow brown sand with clay, trace silt, medium to fine grained, wet (clay lens ~2" thick)
0	18	24	34-36	2,3,3,5		34	Same as above
0	19	10	36-38	4,7,7,3		36	Moderate orange brown sand, trace silt, medium grained, wet
0	20	24	38-40	5,9,11,12		38	Moderate yellow brown, orange brown and light gray sand with clay, medium to fine grained, wet, gray clay ≈ 1.5" thick
						40	End of boring: 40 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. MW-23A

Study No. 06619J03 Date 8/23/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 1100 Ended 1745
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA
Hole Diam. (in.) 6¼
Final Depth (ft.) 35
Casing Diam. (in.) 4
Casing Interval (ft.) 20
Screen Interval (ft.) 15
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W. READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER
Type Split Spoon
Hammer 130 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	1	8	0-2	3,2,2,2	Fill	0	Silt, black
0	2	6	2-4	2,1,1,1		2	Dark orange brown silty fine sand, fine grained, wet Same as above, trace coal/rock fragments
0	3	5	4-6	3,1,3,4		4	Same as above, moist
0	4	18	6-8	2,4,6,7	Silt and Sand	6	Moderate orange brown silty sand, trace mica, fine grained, dense, moist
0	5	24	8-10	7,9,8,7		8	Same as above, moist to wet
0	6	4	10-12	2,3,4,4		10	Moderate orange brown sandy silt, moist, dense
0	7	10	12-14	3,3,4,4		12	Moderate orange brown silty sand, fine grained, dense, moist, no odor
0	8	18	14-16	2,3,4,4		14	Moderate orange brown sandy silt, fine grained, dense, moist, no odor
0	9	24	16-18	3,4,5,6		16	Moderate orange brown silty sand, fine grained, dense, moist, no odor
0	10	20	18-20	2,3,4,5		18	Same as above, moist, no odor
0	11	22	20-22	4,5,5,5		20	Moderate orange brown sand, trace silt, medium grained, moist, no odor

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. MW-23A

Study No. 06619J03 Date 8/23/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 1100 Ended 1745
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 6¼
Final Depth (ft.) 35
Casing Diam. (in.) 4
Casing Interval (ft.) 20
Screen Interval (ft.) 15
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 130 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	12	24	22-24	3,4,4,4	Sand	22	Moderate orange brown silty sand, fine grained, moist to wet, no odor
0	13	24	24-26	3,1,2,2		24	Moderate orange brown sand with silt, medium grained, wet, no odor
0	14	24	26-28	2,3,3,3		26	Same as above
0	15	24	28-30	1,2,2,3		28	Same as above
0	16	24	30-32	3,2,3,4		30	Same as above
0	17	NA	32-34	1,3,4,5		32	Same as above
						34	Same as above
							End of boring: 35 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. MW-24A

Study No. 06619J03 Date 8/25/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 1630 Ended 1900
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 35
Casing Diam. (in.) 4
Casing Interval (ft.) 15-0
Screen Interval (ft.) 35-15
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	1	20	0-2	3,4,4,4	Silt	0	Black silt, trace sand, dry
0	2	22	2-4	2,2,2,3		2	Same as above
0	3	20	4-6	3,4,6,12		4	4-5': Same as above 5-6': Moderate orange brown silt with sand, very dense, moist, medium to fine grained, no odor
107	4	10	6-8	3,4,5,7	Sand	6	6-7.5': Sand with silt, coarse grained, moist, wood fragments present 7.5-8': Black silt, trace sand, moist, odor present
15	5	--	8-10	4,5,6,8	Silt	8	Moderate orange brown silt, trace sand, black staining in cracks, very dense, moist, odor present
254	6	24	10-12	7,9,8,9		10	Same as above
298	7	24	12-14	3,4,6,6		12	Same as above, strong odor present
--	8	0	14-16	8,6,7,6		14	No recovery, wood fragments present
39	9	18	16-18	4,7,8,9		16	16-17': Moderate orange brown silt, trace sand, black staining in cracks, odor present 17-18': Yellow brown sand, trace silt, medium grained, moist, black staining
77	10	20	18-20	3,4,6,7	Sand	18	Light gray to yellow brown sand, trace silt, medium grained, moist
--	11	0	20-22	3,4,5,4		20	No recovery, wood fragments present

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. MW-24A

Study No. 06619J03 Date 8/25/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 1630 Ended 1900
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 35
Casing Diam. (in.) 4
Casing Interval (ft.) 15-0
Screen Interval (ft.) 35-15
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	12	24	22-24	3,2,2,2	Sand	22	Light gray to black silty sand, fine to medium grained, wet at 24 feet
10	13	22	24-26	2,3,6,7		24	24-25': Black sand with silt, medium grained, wet 25-26': Moderate brown sandy silt, wet, black staining and sheen present
26	14	24	26-28	2,3,2,2	Silt Sand	26	Light gray silty sand, medium to fine grained, wet, visible sheen present
53	15	22	28-30	3,4,3,3		28	Same as above, wet, gray to black staining
135	16	6	30-32	2,2,2,2		30	Same as above, wet
138	17	24	32-34	3,3,3,3		32	32-33.5': Same as above, wet
						34	33.5-34': Moderate orange brown and orange brown silty sand, medium to fine grained, wet
							End of boring: 35 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. TW-1

Study No. 06619J03 Date 8/24/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 1120 Ended 1500
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 6¼
Final Depth (ft.) 45
Casing Diam. (in.) 4
Casing Interval (ft.) 23
Screen Interval (ft.) 20
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 130 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
					Sand	0	Silty sand, dark brown
						2	
0	1	24	4-6	5,7,8,9	Silt	4	Moderate brown silt, trace sand, trace coal, fine grained, dense, dry, no odor
						6	
						8	
0	2	22	9-11	5,6,6,7		10	Moderate brown silt, trace sand, trace mica, fine grained, interbedded fine sands
						12	
0	3	20	14-16	4,3,4,4		14	Same as above
					Sand	16	Moderate brown sand, trace silt, medium grained
						18	
0	4	20	19-21	3,3,4,4	Silt	20	Moderate brown sandy silt, fine grained, dense, moist

REMARKS:
(1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. TW-1

Study No. 06619J03 Date 8/24/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 1120 Ended 1500
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 6¼
Final Depth (ft.) 45
Casing Diam. (in.) 4
Casing Interval (ft.) 23
Screen Interval (ft.) 20
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 130 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	5	20	22-24	2,4,6,4	Silt	22	
0	6	2	24-26	1,2,2,2	Sand	24	Moderate brown sand, trace silt, medium grained Silty sand, medium to fine grained, wet, no odor
						26	
						28	
0	7	22	29-31	3,1,3,3		30	Same as above, wet
						32	
0	8	24	34-36	2,1,2,3		34	Same as above, wet
						36	
						38	
0	9	24	39-41	3,4,4,7	Clay	40	Moderate orange sand with silt Light gray sand interbedded wtih clay Light gray sand, medium grained Light gray to orange brown clay with sand
						42	
0	10	20	44-46	5,15,50/refusal	Sand Bedrock 45'	44	Sand, trace silt, medium to coarse grained End of boring: 45'

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. TW-2

Study No. 06619J03 Date 8/29/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By S. Anderson
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 0830 Ended 1000
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 42
Casing Diam. (in.) 4
Casing Interval (ft.) 18-0
Screen Interval (ft.) 38-18
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
						0	
						2	
						4	
0	1	14	5-7	8,7,6,6	Silt		Dark brown silt with clay, dry, debris material (brick, concrete) present
						6	
						8	
0	2	19	10-12	6,6,6,7		10	Same as above, dry
						12	
						14	
0	3	16	15-17	6,6,6,10			Mottled moderate brown and black silt, trace clay, moist
						16	
						18	
0	4	21	20-22	5,3,5,6		20	20-21.5': Moderate brown sandy silt with clay, moist 21.5-22': Moderate brown silty sand, medium grained, moist
					Sand		

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. TW-2

Study No. 06619J03 Date 8/29/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By S. Anderson
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 0830 Ended 1000
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 42
Casing Diam. (in.) 4
Casing Interval (ft.) 18-0
Screen Interval (ft.) 38-18
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
						22	
						24	
0	5	22	25-27	1,4,3,5	Sand	26	Moderate brown sand with silt, medium grained, water table encountered at 25.2 feet
						28	
0	6	22	30-32	4,6,8,12	Silt, Sand	30 32	30-30.5': Same as above, wet 30.5-30.7': Moderate orange brown silt, trace sand, wet 30.7-31.5': Moderate orange brown sand with silt, medium grained, wet 31.5-31.8': Moderate orange brown silt, trace sand, wet 31.8-32': Moderate orange brown sand with silt, medium grained, wet
						34	
0	7	24	35-37	5,5,4,3	Sand	36	35-35.5': Moderate orange brown silty sand with clay, medium grained, wet 35.5-37': Dark orange sand, trace silt, medium grained, wet
						38	
0	8	23	40-42	10,10,10,50/5 (refusal)	Silt Bedrock	40 42	40-41.5': Same as above, wet 41.5-42': Moderate dark brown and gray clayey silt, wet Saprolite consisting of <½" Diameter chips present End of boring: 42 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. PZ-1

Study No. 06619J03 Date 8/25/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 0650 Ended 0900
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 45
Casing Diam. (in.) 4
Casing Interval (ft.) 23-0
Screen Interval (ft.) 43-23
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type --
Hammer -- lb.
Fall -- in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
					Silt	0	Moderate to dark brown silt with sand, fine grained, moist
						2	
						4	Moderate orange brown silt with sand, fine grained, moist
						6	
						8	
						10	
					Sand	12	Moderate to brown silty sand, medium to fine grained, moist
						14	
					Silt	16	Moderate brown sandy silt, fine grained, moist
					Sand	18	Moderate brown silty sand, fine grained, moist
						20	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing
Note: boring logged from drill cuttings

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. PZ-1

Study No. 06619J03 Date 8/25/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 0650 Ended 0900
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 45
Casing Diam. (in.) 4
Casing Interval (ft.) 23-0
Screen Interval (ft.) 43-23
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type --
Hammer -- lb.
Fall -- in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
					Sand	22	Same as above, moist
						24	
						26	Same as above, water table encountered at approximately 27 feet
						28	
						30	
						32	Same as above, wet
						34	
						36	Same as above, wet
						38	
						40	Same as above, wet
						42	End of boring: 45 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. PZ-2

Study No. 06619J03 Date 8/25/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 0930 Ended 1130
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 45
Casing Diam. (in.) 4
Casing Interval (ft.) 23-0
Screen Interval (ft.) 43-23
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W. READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type --
Hammer -- lb.
Fall -- in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	SAMPLE Rec.(in.)	SAMPLE Depth(ft.)	SAMPLE Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
					Silt	0	Moderate to dark brown silt with sand, moist, sand fraction is fine grained
						2	
						4	
						6	
						8	Moderate orange brown silt with sand, moist, sand fraction is fine grained
						10	10-13': Same as above
						12	
					Sand	14	13-15': Moderate orange brown sand with silt, medium grained, moist
							15-18': Same as above
						16	
					Silt	18	18-20': Moderate orange brown sandy silt, sand fraction is fine grained
					Sand	20	Moderate orange brown silty sand, fine grained, moist

REMARKS:
(1) in feet relative to a common datum
(2) from top of PVC casing
Note: boring logged from drill cuttings

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. PZ-2

Study No. 06619J03 Date 8/25/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By J. Stubbs
Loc. Process Area
M.P. Elevation --
Drilling Started 0930 Ended 1130
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA
Hole Diam. (in.) 12
Final Depth (ft.) 45
Casing Diam. (in.) 4
Casing Interval (ft.) 23-0
Screen Interval (ft.) 43-23
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER
Type --
Hammer -- lb.
Fall -- in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
					Sand	22	
						24	
						26	
			--			28	Same as above, wet
						30	
						32	Same as above, wet
						34	
						36	
						38	Same as above, wet
						40	40-44': Same as above, wet
						42	
					Clay	44	44-45': Gray clay End of boring: 45 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing
Note: boring logged from drill cuttings

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. PZ-3

Study No. 06619J03 Date 8/29/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By S. Anderson
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 1330 Ended 1530
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 41
Casing Diam. (in.) 4
Casing Interval (ft.) 19-0
Screen Interval (ft.) 39-19
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type --
Hammer -- lb.
Fall -- in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
					Silt	0	Moderate orange brown sandy silt, and gravel, dry
						2	
						4	
						6	
							Dark brown silt, trace clay, dry
						8	
						10	
						12	Same as above, dry
						14	
						16	
							Same as above, dry
						18	
						20	Dark brown silt with clay, moist

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing
Note: boring logged using drill cuttings

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. PZ-3

Study No. 06619J03 Date 8/29/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By S. Anderson
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 1330 Ended 1530
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 41
Casing Diam. (in.) 4
Casing Interval (ft.) 19-0
Screen Interval (ft.) 39-19
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type --
Hammer -- lb.
Fall -- in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
						22	
						24	
					Silty Sand	26	Moderate to dark brown silty sand, medium grained, water table encountered at approximately 26 feet.
						28	
						30	
						32	Dark orange to moderate brown sand, trace silt, medium grained, wet
						34	
						36	
						38	Same as above, wet
						40	Same as above, wet
						42	41': Rig chattering, bedrock encountered End of boring: 41 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing
Note: boring logged using drill cuttings

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. PZ-4

Study No. 06619J03 Date 8/29/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By S. Anderson
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 1600 Ended 1730
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 41
Casing Diam. (in.) 4
Casing Interval (ft.) 20-0
Screen Interval (ft.) 40-20
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type --
Hammer -- lb.
Fall -- in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	SAMPLE Rec.(in.)	SAMPLE Depth(ft.)	SAMPLE Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
					Silt and gravel	0	Moderate orange brown sandy silt, and gravel, dry
						2	
						4	
					Silt, trace clay	6	
						8	Dark orange brown silt, trace clay, dry
						10	
						12	Same as above, dry
						14	
						16	
						18	Same as above, dry
						20	Same as above, slightly higher clay fraction, moist

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing
Note: boring logged using drill cuttings

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. PZ-4

Study No. 06619J03 Date 8/29/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By S. Anderson
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 1600 Ended 1730
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA
Hole Diam. (in.) 12
Final Depth (ft.) 41
Casing Diam. (in.) 4
Casing Interval (ft.) 20-0
Screen Interval (ft.) 40-20
Screen Slot & Type 0.020 PVC
Well Status Test Well

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER
Type --
Hammer -- lb.
Fall -- in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
						22	
						24	
			--		Sand	26	Moderate orange brown sand with silt and clay, medium grained, water table encountered at approximately 26 feet.
						28	
						30	
						32	Same as above, wet
						34	
						36	
						38	Same as above, wet
						40	Same as above, wet
						42	41': Rig chatter, bedrock encountered End of boring: 41 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing
Note: boring logged using drill cuttings

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. WT-13A

Study No. 06619J03 Date 8/28/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By S. Anderson
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 1000 Ended 1230
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 34
Casing Diam. (in.) 4
Casing Interval (ft.) 0-14
Screen Interval (ft.) 14-34
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G. W. READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	1	12	0-2	5,10,7,8		0	0-1': Moderate brown to moderate orange silty sand, medium grained, dry 1-2': Dark brown silt with sand, trace clay, dry
0	2	16	2-4	11,9,10,11	Silt and Sand	2	Same as above, dry
0	3	16	4-6	5,6,7,7		4	4-4.5': Moderate black silt with sand, trace clay, dry 4.5-6': Dark brown silt with sand, trace clay, dry
0	4	12	6-8	5,7,8,10		6	Same as above, dry
0	5	18	8-10	5,4,8,7		8	Same as above, moist
0	6	20	10-12	4,6,7,8		10	Same as above, moist
0	7	20	12-14	4,6,7,9		12	12-13': Same as above, moist 13-13.5': Moderate brown silty sand, medium grained, moist 13.5-14': Dark brown silt with sand, trace clay, dry
0	8	18	14-16	2,3,3,3	Sand	14	14-14.5': Same as above, moist 14.5-16': Moderate brown silty sand, medium grained, moist
0	9	18	16-18	2,3,3,3		16	Same as above, water encountered at 16 feet
0	10	16	18-20	4,3,3,2		18	18-18.5': Same as above, moist 18.5-19': Light brown sand, trace silt, medium grained, dry 19-20': Moderate brown sand with clay, medium grained, moist
0	11	15	20-22	4,4,5,6		20	20-20.5': Moderate brown silty sand, medium grained, wet at 20 feet. 20.5-20.7': Light brown sand, trace silt, medium grained, wet 20.7-22': Moderate brown silty sand, trace clay, medium grained, wet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. WT-13A

Study No. 06619J03 Date 8/28/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By S. Anderson
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 1000 Ended 1230
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA
Hole Diam. (in.) 12
Final Depth (ft.) 34
Casing Diam. (in.) 4
Casing Interval (ft.) 0-14
Screen Interval (ft.) 14-34
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER
Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	12	12	22-24	4,3,3,3	Sand	22	Same as above, water table encountered at 23 feet
0	13	10	24-26	3,3,4,4		24	Same as above, wet
0	14	15	26-28	2,2,4,4		26	26-27': Same as above, wet 27-28': Moderate brown sand with silt, trace clay, medium grained, wet
0	15	18	28-30	2,2,4,5		28	Same as above, wet
0	16	24	30-32	3,3,4,4		30	30-30.5': Same as above, wet 30.5-32': Moderate brown sand with silt, medium grained, wet
0	17	24	32-34	3,5,6,7		32	32-33': Same as above, wet 33-34': Moderate brown and dark orange silty sand, medium grained, wet
						34	End of boring: 34 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. WT-14A

Study No. 06619J03 Date 8/27/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By J. Stubbs
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started ~1400 Ended 2000
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 40
Casing Diam. (in.) 4
Casing Interval (ft.) 15-0
Screen Interval (ft.) 35-15
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	1	18	0-2	3,4,5,6	Sandy silt (fill)	0	Moderate brown sandy silt, dry, sand fraction is fine grained
0	2	24	2-4	5,7,6,7		2	2-3.5': Same as above 3.5-4': Gray gravelly sand, coarse grained, wet, green and blue staining
1	3	24	4-6	–		4	Same as above
2	4	24	6-8	–		6	Same as above
1	5	12	8-10	3,1,1,4		8	Same as above
0	6	4	10-12	3,7,23,11	Fill	10	Interbedded moderate brown, dark brown, and red brown sand, trace silt, medium grained, moist
69	7	20	12-14	1,2,2,2		12	Dark brown sand, trace silt, trace gravel, medium grained, moist
0	8	2	14-16	7,27,16,18		14	No recovery
49	9	12	16-18	8,5,3,3		16	Light gray sand with silt, medium grained, dry to moist, brick fragments present
14	10	2	18-20	8,8,5,5		18	Same as above
13	11	24	20-22	5,7,5,5		20	Light blue gray, black, green, and moderate brown silty sand, moist, wood present

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. WT-14A

Study No. 06619J03 Date 8/27/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By J. Stubbs
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started ~1400 Ended 2000
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 40
Casing Diam. (in.) 4
Casing Interval (ft.) 15-0
Screen Interval (ft.) 35-15
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
6	12	3	22-24	8,14,13,10		22	Moderate brown to light gray silty sand, medium grained, moist
9	13	18	24-26	4,3,3,3	Silt	24	Moderate brown silt, trace sand, moist, soft
2	14	24	26-28	2,3,3,5		26	Same as above
–	15	–	28-30	3,2,3,7		28	28-29': Same as above
3	16	24	30-32	3,3,4,6	Sand Silt	30	29-30': Moderate brown silty sand, fine to medium grained, wet Moderate brown silt with sand, moist, sand fraction is fine grained
0	17	24	32-34	3,5,7,8	Sand	32	Moderate brown silty sand, fine to medium grained, wet
1	18	24	34-36	3,5,3,7		34	Moderate yellow brown, orange brown, and light gray sand with silt, fine grained, wet
0	19	24	36-38	5,7,6,10		36	Light gray sand with silt, fine grained, wet
12	20	24	38-40	3,5,7,9		38	Light gray and yellow brown sand with silt, fine to medium grained, wet
						40	End of boring: 40 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. WT-15A

Study No. 06619J03 Date 8/27/94
Project Monsanto Nitro
Client Monsanto Company
Page 1 of 2
Logged By J. Stubbs
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 0715 Ended 0920
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 24
Casing Diam. (in.) 4
Casing Interval (ft.) 9-0
Screen Interval (ft.) 24-9
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0	1	12	0-2	3,5,9,7	Silt	0	Moderate brown silt with gravel, moist, gravel = 1" diameter, brick and glass debris present
0	2	16	2-4	2,5,6,6		2	Moderate brown to dark gray silt with gravel, moist, glass fragments present
0	3	10	4-6	4,4,4,9		4	Same as above
0	4	24	6-8	5,7,7,9		6	Moderate brown silt, trace sand, moist, brick fragments present, dense
0	5	24	8-10	3,9,7,6		8	Same as above, odor present
2	6	24	10-12	6,3,3,3		10	Same as above, moist
--	7	0	12-14	4,3,3,6		12	No recovery, water present
0	8	24	14-16	5,7,10,11	Clay	14	Light gray clay, very dense, wet, moderate brown staining
0	9	18	16-18	5,7,9,10		16	Same as above
0	10	20	18-20	5,5,7,8		18	Same as above
0	11	24	20-22	5,5,9,11		20	Same as above

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ROUX ASSOCIATES, INC.
CONSULTING GROUND-WATER GEOLOGISTS

GEOLOGIC LOG

Well No. WT-15A

Study No. 06619J03 Date 8/27/94
Project Monsanto Nitro
Client Monsanto Company
Page 2 of 2
Logged By J. Stubbs
Loc. Waste Treatment Plant Area
M.P. Elevation --
Drilling Started 0715 Ended 0920
Driller CTL Engineering, Inc.
Type of Rig CME Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 12
Final Depth (ft.) 24
Casing Diam. (in.) 4
Casing Interval (ft.) 9-0
Screen Interval (ft.) 24-9
Screen Slot & Type 0.020 PVC
Well Status Monitoring

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

OVM (ppm)	SAMPLE No.	Rec.(in.)	Depth(ft.)	Blow/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
--	12	--	22-24	4,5,4,7		22	Same as above
						24	End of boring: 24 feet

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

WELL MW-1A
(Drilled and Installed 9/8/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	12	Silt and clay, 0.5 foot layer of sand and stone at surface, brown, dry.
4.5 - 6.0	49	Clay, some silt, trace fine sand, brown, dry.
9.5 - 11.0	85	Sand, medium, brown, dry.
14.5 - 16.0	10	Sand, medium, brown, dry.
19.5 - 21.0	<0.5	Sand, fine-medium, trace silt, brown, wet.
24.5 - 26.0	<0.5	Sand, fine-medium, trace silt, brown, wet.
29.5 - 31.0	<0.5	Silt and fine sand, orange and black layer at 30.5 feet, grey, wet.

Borehole Depth:	32 feet
Water Encountered:	18.5 feet
Well Depth:	30 feet
Screened Interval:	20-30 feet
Well Construction:	22 feet of casing over 10 feet of screen; gravel pack and natural sand 17-30 feet; bentonite seal 16-17 feet; grouted 0-16 feet.

WELL MW-1B
(Drilled and Installed 1/02/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
35.0 - 36.5	<0.5	Sand, fine, some silt, wet, brown.
40.0 - 41.5	<0.5	Sand, medium, little silt, trace gravel, wet, brown.
45.0 - 46.5	3.8	Sand, medium to coarse, wet, grey to brown.
50.0 - 51.5	<0.5	Sand, medium to coarse, some gravel, wet, brown.

Borehole Depth:	55 feet
Water Encountered:	18.5 feet
Well Depth:	55 feet
Screened Interval:	40-55 feet
Well Construction:	42 feet of casing over 15 feet of screen; natural sand pack 29-55 feet; bentonite seal 27-29 feet; grouted 0-27 feet.

WELL MW-2A
(Drilled and installed 9/9/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	2	Sand and gravel, pieces of stone, grey, dry, no odor.
4.5 - 6.0	1	Silt and clay, trace fine sand, pieces of gravel, grey, dry, no odor.
9.5 - 11.0	120	Silt and clay, trace fine sand, grey, dry, no odor.
14.5 - 16.0	300	Silt, little fine sand, black silty sand layer at 14.5-15 feet with strong odor, grey brown, dry, some odor.
19.5 - 21.0	120	Sand, medium, trace silt, lense of silt at 21 feet, brown, wet, little odor.
24.5 - 26.0	22	Sand, medium, lense of gravel at 25.5 feet, brown, wet, no odor.
29.5 - 31.0	90	Sand, medium, trace silt, brown, wet, no odor.

Borehole Depth:	32 feet
Water Encountered:	19 feet
Well Depth:	30 feet
Screened Interval:	20-30 feet
Well Construction:	22 feet of casing over 10 feet of screen; gravel pack and natural sand 19-30 feet; bentonite seal 16-19 feet, grouted 0-16 feet.

WELL MW-2B
(Drilled and Installed 1/14/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
38.0 - 39.5	--	Sand, medium, trace silt, pieces of gravel, wet, brown.
45.0 - 46.5	--	Sand, medium to coarse, trace silt, wet, grey, pieces of gravel and coal.
50.0 - 51.5	--	DO
55.0 - 56.5	--	Sand, medium, grey, wet over grey siltstone.

Borehole Depth:	55 feet
Well Depth:	55 feet
Screened Interval:	40-55 feet
Well Construction:	42 feet of casing over 15 feet of screen; natural sand pack 35-55 feet; bentonite seal 20-35 feet; grouted 0-20 feet.

WELL MW-3A
(Drilled and Installed 9/9/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	1	Silt, some fine sand, pieces of cobble, brown, dry, no odor.
1.5 - 3.0	22	Silt, some fine sand, pieces of gravel, grey, dry, no odor.
3.0 - 4.5	7	Silt, some fine sand, pieces of gravel, grey, dry, no odor.
4.5 - 6.0	.5	Clay, some silt, grey sand layer at 4.5 feet, brown, dry, no odor.
6.0 - 7.5	.5	Clay, some silt, trace fine sand, brown, dry, no odor.
7.5 - 9.0	1.5	Clay, some silt, trace fine sand, brown, dry, no odor.
9.0 - 10.5	2	Silt and clay, little fine sand, brown, dry, no odor.
10.5 - 12.0	2	Silt and clay, little fine sand, brown, dry, no odor.
12.0 - 13.5	5	Silt and clay, trace fine sand, brown, dry, no odor.
14.5 - 16.0	17	Sand, fine, trace silt, layer of sandy silt 14.5-15 feet, brown, dry, no odor.

WELL MW-3A (continued)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
19.5 - 21.0	11	Sand, fine-medium, brown, dry, no odor.
24.5 - 26.0	15	Silt, little fine sand, brown, dry, no odor.
29.5 - 31.0	30	Silt, some fine sand, brown, wet, no odor.
33.5 - 35.0	65	Sand, fine, some silt, brown, wet, no odor.

Borehole Depth:	35 feet
Water Encountered:	29 feet
Well Depth:	35 feet
Screened Interval:	25-35 feet
Well Construction:	27 feet of casing over 10 feet of screen; gravel pack 24 - 35 feet; bentonite seal 23 - 24 feet; grouted 0-23 feet.

WELL MW-3B
(Drilled and Installed 12/20/84)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
38.0 - 39.5	--	Sand, fine to medium, brown, wet.
43.0 - 44.5	--	Sand, fine to medium, brown, wet.
48.0 - 49.5	--	No Recovery. Cuttings: Sand, medium, brown.
53.0 - 54.5	--	Sand, medium, trace silt, trace gravel, brown, layer of grey clay with some sand and pieces of coal @ 56.6 feet, wet.
58.0 - 59.5	--	Sand, medium to coarse with gravel, brown to olive green, layers of grey clay, trace coal, wet.
60.0 - 61.5	--	Clay, trace silt, light grey to grey, wet.

Borehole Depth:	61 feet
Water Encountered:	20 feet
Well Depth:	61 feet
Screened Interval:	46-61 feet
Well Construction:	48 feet of casing over 15 feet of screen; natural sand pack 42-61 feet; bentonite seal 15-42 feet; grouted 0-15 feet.

WELL MW-4A
(Drilled and Installed 9/12/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0.- 2.0	<0.5	Silt, some fine sand, pieces of gravel, dry, brown, no odor.
2.0 - 4.0	ND	Silt, some clay, trace fine sand, pieces of gravel, brown, dry, no odor.
4.0 - 6.0	ND	Silt and clay, trace fine sand, brown, dry, no odor.
6.0 - 8.0	ND	Silt and clay, trace fine sand, brown, dry, no odor.
8.0 - 10.0	24	Silt and clay, trace fine sand, lense of medium sand at 10 feet, brown, dry, no odor.
10.0 - 12.0	55	Silt and medium sand, lenses of medium sand at 11 and 11.5 feet, brown, dry, no odor.
12.0 - 14.0	14	Sand, medium, some silt, brown, dry, no odor.
14.0 - 16.0	90	Sand, medium, some silt, brown, dry, no odor.
19.0 - 21.0	160	Clay, some silt, trace fine sand, layer of medium sand at 19 - 19.5 feet, brown, dry, no odor.

+48

WELL MW-4A (continued)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
24.0 - 26.0	80	Clay, some silt, lense of medium sand at 25 feet, brown, wet, no odor.
29.0 - 31.0	60	Silt, some medium sand, brown, wet, no odor.
34.0 - 36.0	100	Silt, some medium sand, lense of medium sand at 34.5 feet, brown, wet, no odor.
39.0 - 41.0	60	Sand, medium, some silt, brown, wet, no odor.
44.0 - 46.0	60	Sand, medium-coarse, some gravel and pebbles, wet, brown, no odor.
49.0 - 51.0	33	Sand, trace silt, pieces of gravel, rust brown, wet, no odor.
54.0 - 56.0	14	Sand, medium-coarse, grey brown, wet, no odor.
59.0 - 60.5	14	Sand, medium-coarse, grey, wet, no odor.

Borehole Depth:	60.5 feet
Water Encountered:	26 feet
Well Depth:	37.5 feet
Screened Interval:	27.5 - 37.5 feet
Well Construction:	30 feet of casing over 10 feet of screen; gravel pack 23.5 - 37.5 feet; bentonite seal 22.5 - 23.5 feet; grouted 0-22.5 feet.

WELL MW-5A
(Drilled and Installed 8/31/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	<0.5	Clay, some sand, pieces of stone and rubble, grey brown, dry, no odor.
1.5 - 3.0	2.2	Clay, trace silt, grey brown, dry, no odor
3.0 - 4.5	2.3	Clay, trace silt, brown, dry, no odor.
4.5 - 6.0	2.6	Clay, some silt, trace fine sand, brown, dry, no odor.
6.0 - 7.5	2.4	Clay, some silt, trace fine sand, brown, dry, no odor.
7.5 - 9.0	2.8	Clay, some silt, trace fine sand, brown, dry, no odor.
9.0 - 10.5	3.1	Silt, some clay, trace fine sand, brown, dry, no odor.
10.5 - 12.0	2.6	Sand, medium, some silt, brown, dry, no odor.
12.0 - 13.5	3.2	Silt, some fine sand, brown, dry, no odor.
13.5 - 15.0	1.0	Silt, some fine sand, lense of medium sand at 14.5 feet, brown, dry, no odor.

+5B
WELL MW-5A (Continued)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
15.0 - 16.5	1.0	Sand, some silt, fine, brown, dry, no odor.
19.5 - 21.0	2.1	Clay, trace silt, lenses of medium sand at 19.5 - 20 feet, brown, dry, no odor.
24.5 - 26.0	6.0	Clay, trace silt, lenses of medium sand at 24.5 and 25.5 feet, brown, moist, no odor.
29.5 - 30.0	18	Sand, medium, some silt, lense of silt at 30.5 feet, brown, wet, no odor.
34.5 - 36.0	19	Sand, medium, some silt, lense of silty clay at 35 feet, brown, wet, no odor.
39.5 - 41.0	210	Sand, medium, trace silt, brown, wet, no odor.
44.5 - 46.0	60	Sand,medium, trace silt, pieces of stone, brown, wet, no odor.
49.5 - 51.0	22	Sand, medium, trace silt, brown, wet, no odor.
54.5 - 56.0	80	Sand, medium-coarse, grey, wet, no odor.
58.5 - 60.0	60	Clay, some fine sand, grey, wet, no odor.

A+5B

WELL MW-5 (Continued)

Borehole Depth:	58.5 feet
Water Encountered:	24.5 feet
Well Depth:	33 feet
Screened Interval:	23 - 33 feet
Well Construction:	35 feet of casing over 10 feet of screen; gravel pack 21 - 33 feet; bentonite seal 19.5.- 21 feet; grouted 0-19.5 feet.

WELL MW-6A
(Drilled and Installed 9/1/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	70	Silt and clay, pieces of gravel, chat layer at surface, red brown, dry, no odor.
1.5 - 3.0	115	Sand and gravel, some silt, dry, no odor
3.0 - 4.5	62	Sand and gravel, layer of red rubble at 3.5 - 4.5 feet, brown, dry, no odor.
4.5 - 6.0	90	Silt and clay, layer of red rubble over black silt at 4.5 feet, brown, dry, strong odor in black silt.
6.0 - 7.5	95	Clay, some silt, veins of black silt, brown, dry, odor in black veins.
7.5 - 9.0	105	Clay, some silt, trace fine sand, brown, dry, some odor.
9.0 - 10.5	34	Silt, some fine sand, veins of black silt, brown, dry, some odor.
10.5 - 12.0	42	Silt, some fine sand, layer of black fine sand at 12 feet, brown, dry, some odor.
12.0 - 13.5	90	Silt, some fine sand, brown, dry, slight odor.

WELL MW-6A (Continued)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
13.5 - 15	58	Silt and fine sand, layer of black medium sand at 14.5 - 15 feet, brown, dry, odor.
15 - 16.5	110	Silt and medium sand, lense of black medium sand at 16 feet, brown, dry, odor.
20 - 21.5	105	Silt and sand, layer of black medium sand at 20.5 -21 feet, brown, moist, odor.
25 - 26.5	115	Silt and clay, some medium sand, lense of medium sand at 25.5 feet, brown, wet, no odor.
28.5 - 30	750	Sand, trace silt, lense of black sand at 29.5 feet, lense of clayey silt at 30 feet, brown, wet, no odor.

Borehole Depth:	30 feet
Water Encountered:	24 feet
Well Depth:	30 feet
Screened Interval:	20 - 30 feet
Well Construction:	22 feet of casing over 10 feet of screen; gravel pack and natural sand 16 - 30 feet; bentonite seal 15 - 16 feet; grouted 0 - 15 feet.

WELL MW-6B
(Drilled and Installed 12/17/84)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
30.0 - 31.5	400	Sand, medium, little silt, dark grey, wet, slight odor.
35.0 - 36.5	500	Sand, medium, little silt, brown, wet, no odor.
40.0 - 41.5	100	Sand, medium to fine, trace silt, grey, lense of brown sand @ 39' - 40', wet.
45.0 - 46.5	250	Sand, medium to fine, some silt, trace gravel, grey, lense of rust brown silt, fine sand @ 46', wet.
50.0- 51.5	15	Sand, medium, trace silt, rust brown, pieces of coal, wet.
55.0 - 56.5	ND	Sand, medium to coarse, trace silt, grey, grey sand and medium gravel @ 56.5'.

Borehole Depth:	58 feet
Well Depth:	58 feet
Screened Interval:	43-58 feet
Well Construction:	45 feet of casing over 15 feet of screen; natural sand pack 35-58 feet; bentonite seal 10-35 feet; grouted 0-10 feet.

WELL MW-7
(Drilled and Installed 10/1/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	>1000	Clay, some silt, pieces of gravel and rubble, red brown, dry, slight odor.
4.5 - 6.0	550	Clay, some silt, red brown, dry, no odor.
9.5 - 11.0	430	Clay, some silt, trace fine sand, red brown, dry, no odor.
14.5 - 16.0	515	Clay, some silt, lense of fine sand at 15 feet, brown, dry, no odor.
19.5 - 21.0	140	Clay, some silt, trace fine sand, brown, grey, no odor.
24.5 - 26.0	520	Silt, some fine sand, layer of black fine sand at 24.5 - 25 feet, brown, wet, odor.
28.5 - 30.0	420	Sand, medium, trace silt, brown, wet, no odor.

Borehole Depth:	30 feet
Well Depth:	30 feet
Screened Interval:	20 - 30 feet
Well Construction:	22 feet of casing over 10 feet of screen; gravel pack 19 - 30 feet; bentonite seal 18 - 19 feet; grouted 0 - 18 feet.

WELL MW-8
(Drilled and Installed 9/1/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	4.2	Silt, some sand, pieces of cobble, brown, dry, no odor.
4.5 - 6.0	200	Clay, some silt, brown, dry, no odor.
9.5 - 11.0	105	Clay, some silt, trace fine sand, brown, dry, no odor.
14.5 - 16.0	100	Clay, some silt, brown, dry, no odor.
19.5 - 21.0	115	Sand, medium, some silt, brown, wet, no odor.
24.5 - 26.0	190	Sand, medium, some silt, brown, wet, no odor.
28.5 - 30.0	120	Sand, medium, and silt, brown, wet, no odor.

Borehole Depth:	30 feet
Water Encountered:	19 feet
Well Depth:	30 feet
Screened Interval:	20 - 30 feet
Well Construction:	22 feet of casing over 10 feet of screen; gravel pack and natural sand 19 - 30 feet; bentonite seal 17.5 - 19 feet; grouted 0 - 17.5 feet.

WELL MW-9
(Drilled and Installed 9/8/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	<0.5	Clay, some silt, sand and stone at surface, brown, dry, no odor.
4.5 - 6.0	<0.5	Clay, some silt, trace fine sand, rust brown, dry, no odor.
9.5 - 11.0	<0.5	Clay, some silt, lenses of medium sand at 10 and 11 feet, brown, dry, no odor.
14.5 - 16.0	1.2	Sand, medium, trace silt, brown, wet, no odor.
19.5 - 21.0	7.0	Sand, medium, trace silt, layer of sandy silt at 20 - 20.5 feet, rust brown, wet, no odor.
24.5 - 26.0	4.2	Sand, medium, trace silt, lense of sandy silt at 26 feet, brown, wet, no odor.
27.5 - 29.0	8.4	Sand, medium, grey brown, wet, no odor.

Borehole Depth:	29 feet
Water Encountered:	16 feet
Well Depth:	28 feet
Screened Interval:	18 - 28 feet
Well Construction:	20 feet of casing over 10 feet of screen; gravel pack and natural sand 14.5 - 28 feet; bentonite seal 13.5 - 14.5 feet; grouted 0 - 13.5 feet.

WELL MW-10
(Drilled and Installed 9/7/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	28	Clay, some silt, pieces of gravel, gravel layer on surface, brown, dry, no odor.
4.5 - 6.0	220	Clay, trace silt, trace fine sand, rust brown, dry, no odor.
9.5 - 11.0	1000	Clay, trace silt, trace fine sand, layer of medium silty sand at 10.5 - 11 feet, brown, dry, some odor.
14.5 - 16.0	6.0	Sand, medium, trace silt, brown, dry, no odor.
19.5 - 21.0	15	Sand, medium, brown, wet, no odor.
24.5 - 26.0	88	Sand, medium, layer of silty sand with black layer at 25.5 feet, brown grey, wet, no odor.
28.5 - 29.5	70	Sand, medium, brown grey, wet, no odor.

Borehole Depth:	29.5 feet
Water Encountered:	17 feet
Well Depth:	27 feet
Screened Interval:	17 - 27 feet
Well Construction:	19 feet of casing over 10 feet of screen; natural sand pack 15 - 27 feet; bentonite seal 14 - 15 feet; grouted 0 - 14 feet.

WELL MW-11A
(Drilled and Installed 9/6/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	3.6	Clay and silt, pieces of root, topsoil at surface, rust brown, dry, no odor.
4.5 - 6.0	<0.5	Silt, some medium sand, rust brown, dry, no odor.
9.5 - 11.0	<0.5	Sand, medium, little silt, clayey silt layer at 10.5 feet, brown, dry, no odor.
14.5 - 16.0	<0.5	Sand, medium, lense of black sand at 15 feet, brown, dry, no odor.
19.5 - 21.0	<0.5	Sand, medium, trace silt, brown, wet, no odor.
24.5 - 26.0	<0.5	Sand, medium, trace silt, pieces of gravel, brown, wet, no odor.
29.5 - 31.0	<0.5	Sand, medium, pieces of stone, some gravel, brown, wet, no odor.

Borehole Depth:	31 feet
Water Encountered:	19 feet
Well Depth:	29 feet
Screened Interval:	19 - 29 feet
Well Construction:	21 feet of casing over 10 feet of screen; natural sand pack 15 - 29 feet; bentonite seal 14 - 15 feet; grouted 0 - 14 feet.

WELL MW-11B
(Drilled and Installed 9/6/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
34.5 - 36.0	<0.5	Sand, medium, trace gravel, brown, wet, no odor.
39.5 - 41.0	<0.5	Sand, medium, grey, wet, no odor.
44.5 - 46.0	<0.5	Sand, medium, trace silt, pebble at 46 feet, grey, wet, no odor.
49.5 - 51.0	<0.5	Sand, medium, trace gravel, grey, wet, no odor.
54.5 - 56.0	<0.5	Clay, trace fine sand, grey, wet, no odor.

Borehole Depth:	54.5 feet
Water Encountered:	19 feet
Well Depth:	48 feet
Screened Interval:	38 - 48 feet
Well Construction:	40 feet of casing over 10 feet of screen; natural sand pack 15 - 48 feet; bentonite seal 14 - 15 feet; grouted 0 - 14 feet.

WELL MW-12
(Drilled and Installed 9/7/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0.0 - 1.5	1.0	Sand and gravel, pieces of cobble at 0.5 feet, grey, dry, no odor.
4.5 - 6.0	0.8	Clay, trace silt, pieces of gravel, brown, dry, no odor.
9.5 - 11.0	7.2	Sand, medium, trace silt, brown, dry, no odor.
14.5 - 16.0	11.0	Sand, medium, trace silt, brown, dry, no odor.
19.5 - 21.0	100	Sand, medium, trace silt, grey-brown, wet, no odor.
24.5 - 26.0	150	Silt, trace fine sand, grey, wet, no odor.
28.0 - 29.5	600	Sand, medium, pieces of stone, grey, wet, no odor.

Borehole Depth:	29.5 feet
Water Encountered:	16.5 feet
Well Depth:	28 feet
Screened Interval:	18 - 28 feet
Well Construction:	20 feet of casing over 10 feet of screen; gravel pack and natural sand 14.6 - 28 feet; bentonite seal 13.6 - 14.6 feet; grouted 0 - 13.6 feet.

WELL MW-13
(Drilled 9/12/83; Installed 9/13/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0 - 1.5	<0.5	Sand and gravel, pieces of stone, grey, dry, no odor.
4.5 - 6	18	Silt, some clay, trace fine sand, brown, dry, no odor.
9.5 - 11	6.0	Sand, medium, trace silt, brown, dry, no odor.
14.5 - 16	90	Sand, medium, trace silt, grey brown, dry, no odor.
19.5 - 21	90	Sand, medium, pebble at 20 feet, grey, wet, no odor.
24.5 - 26	120	Silt, medium, lense of gravel at 26 feet, grey, wet, no odor.
27.5 - 29	90	Sand, medium-coarse, grey, wet, no odor.

Borehole Depth: 29 feet
Water Encountered: 17 feet
Well Depth: 28 feet
Screened Interval: 18 - 28 feet
Well Construction: 20 feet of casing over 10 feet of screen; natural sand pack 15.5 - 28 feet; bentonite seal 14.5 - 15.5 feet; grouted 0 - 14.5 feet.

WELL MW-14
(Drilled and installed 9/2/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0 - 1.5	<0.5	Clay and silt, topsoil to 0.5 feet, brown, dry, no odor.
4.5 - 6	<0.5	Silt, some fine sand, brown, dry, no odor.
9.5 - 11	<0.5	Silt and fine sand, brown, dry, no odor.
14.5 - 16	0.7	Sand, medium, some silt, brown, wet, no odor.
19.5 - 21	3.8	Sand, medium, little silt, lense of silt at 21 feet, brown, wet, no odor.
24.5 - 26	4.0	Sand, medium, trace silt, lense of darker sand at 25.5 feet, brown, wet, no odor.
26.5 - 28	14	Sand, medium, trace silt, lenses of darker sand, brown, wet, no odor.

Borehole Depth:	29 feet
Water Encountered:	15 feet
Well Depth:	28 feet
Screened Interval:	18 - 28 feet
Well Construction:	20 feet of casing over 10 feet of screen; gravel pack and natural sand 15 - 28 feet; bentonite seal 14 - 15 feet; grouted 0 - 14 feet.

WELL MW-15
(Drilled and Installed 9/2/83)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
0 - 1.5	1.1	Clay, some silt, pieces of gravel, topsoil to 0.5 feet, brown, dry, no odor.
4 - 5.5	1.2	Clay, some silt, pieces of rubble, red brown, dry, no odor.
9 - 10.5	0.8	Silt, some fine sand, layer of black sand at 10.4 feet, brown, dry, no odor.
14 - 15.5	1.6	Sand, fine-medium, trace silt, brown, wet, no odor.
19 - 20.5	2.5	Sand, fine-medium, trace silt, brown, wet, no odor.
24 - 25.5	1.6	Sand, fine-medium, trace silt, brown, wet, no odor.
26.5 - 28	2.2	Sand, fine-medium, trace silt, brown, wet, no odor.

Borehole Depth:	29 feet
Water Encountered:	13 feet
Well Depth:	20 feet
Screened Interval:	10 - 20 feet
Well Construction:	12 feet of casing over 5 feet of screen; gravel pack 10 - 20 feet; bentonite seal 9 - 10 feet; grouted 0 - 9 feet.

WELL MW-17A
(Drilled and Installed 1/31/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
5.0 - 6.5	ND	Clay and some silt, little medium sand, dry, brown.
10.0 - 11.5	ND	Clay, some silt, dry, dark brown.
15.0 - 16.5	ND	Clay, some silt, dry, dark brown.
20.0 - 21.5	1.8	Clay, some silt, trace fine sand, wet, dark brown.
25.0 - 26.5	1.7	Sand, medium to coarse, trace silt, wet, brown.
30.0 - 31.5	ND	Sand, medium to coarse, wet, brown.
35.0 - 36.5	ND	Sand, medium, wet, brown.
40.0 - 41.5	ND	Sand, medium, wet, brown.

Borehole Depth:	41.5 feet
Water Encountered:	21.5 feet
Well Depth:	40.0 feet
Screened Interval:	30 - 40 feet
Well Construction:	32 feet of casing over 10 feet of screen; gravel pack and natural sand 26 - 40 feet; bentonite seal 24 - 26 feet; grouted 0 - 24 feet.

WELL MW-17B
(Drilled and Installed 2/04/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
45.0 - 46.5	ND	Sand, medium, wet, grey.
50.0 - 51.5	ND	Sand, medium, some silt, wet, grey.

Borehole Depth:	29 feet
Water Encountered:	15 feet
Well Depth:	28 feet
Screened Interval:	18 - 28 feet
Well Construction:	38 feet of casing over 20 feet of screen; gravel pack and natural sand 30 - 56 feet; bentonite seal 25 - 30 feet; grouted 0 - 25 feet.

WELL MW-18A
(Drilled and Installed 2/05/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
5.0 - 6.5	560	Clay, some silt, dry, dark brown, coal fragments.
10.0 - 11.5	180	Sand, some silt, dry, brown.
15.0 - 16.5	60	Clay, some silt, wet, dark brown.
20.0 - 21.5	120	Clay, some sand, wet, brown.
25.0 - 26.5	120	Clay, some sand, wet, brown.
30.0 - 31.5	50	Clay, some silt, wet, brown.
35.0 - 36.5	420	Sand, little clay, wet, grey.
40.0 - 41.5	140	Sand, coarse, wet, grey.

Borehole Depth: 40 feet
Water Encountered: 20-21 feet
Well Depth: 40 feet
Screened Interval: 30-40 feet
Well Construction: 32 feet of casing over 10 feet of screen; natural sand pack 24-40 feet; bentonite seal 20-24 feet; grouted 0-20 feet.

WELL MW-18B
(Drilled and Installed 2/05/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
45.0 - 46.5	6.5	Sand, some silt, wet, grey, gravel.
50.0 - 51.5	5.8	Sand, medium to coarse, wet, grey, coal fragments.

Borehole Depth:	55 feet
Water Encountered:	20-21 feet
Well Depth:	55 feet
Screened Interval:	40-55 feet
Well Construction:	42 feet of casing over 15 feet of screen; natural sand pack 38-55 feet; bentonite seal 35-38 feet; grouted 0-38 feet.

WELL MW-19A
(Drilled and Installed 1/02/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
5.0 - 6.5	--	Clay, some silt, dry, dark brown.
10.0 - 11.5	--	Silt, some medium sand, dry, brown.
15.0 - 16.5	--	Silt, some medium sand, dry, brown.
20.0 - 21.5	--	Silt and sand, medium, dry, brown.
25.0 - 26.5	--	Sand, medium, some silt, wet, brown.
30.0 - 31.5	--	Sand, medium and silt, wet, brown.
35.0 - 36.5	--	Sand, medium, little silt, wet, grey with brown stringers.

Borehole Depth:	40 feet
Well Depth:	40 feet
Screened Interval:	30-40 feet
Well Construction:	32 feet of casing over 10 feet of screen; natural sand pack 27-40 feet; bentonite seal 25-27 feet; grouted 0-25 feet.

WELL MW-19B
(Drilled and Installed 1/02/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
40.0 - 41.5	--	Sand, fine to medium, little silt, grey to brown, coal fragments.
45.0 - 46.5	--	Sand, medium, little silt, wet, grey.
50.0 - 51.5	--	Sand, medium, some gravel, wet, grey.
55.0 - 56.5	--	Sand, medium, little gravel, wet, rust brown, coal fragments.
60.0 - 61.5	--	Sand, coarse, some gravel, wet, grey, coal fragments.

Borehole Depth:	62 feet
Well Depth:	62 feet
Screened Interval:	47-62 feet
Well Construction:	49 feet of casing over 15 feet of screen; natural sand pack 45-62 feet; bentonite seal 10-45 feet; grouted 0-10 feet.

WELL MW-20A
(Drilled and Installed 1/29/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
5.0 - 6.5	ND	Clay and silt, dark dry, brown.
10.0 - 11.5	1.0	Clay and silt, dark dry, brown.
15.0 - 16.5	0.5	Silt, some medium sand, dry, brown.
20.0 - 21.5	0.5	Silt and clay, little medium sand, dark brown, moist.
25.0 - 26.5	140	Silt, little fine sand, wet, brown.
30.0 - 31.5	200	Sand, medium, some silt, wet, brown with black stringers.
35.0 - 36.5	31	Sand, medium, wet, brown, coal fragments.
40.0 - 41.5	340	Sand, medium, little silt, wet, brown to grey.

Borehole Depth:	40 feet
Well Depth:	40 feet
Screened Interval:	30-40 feet
Well Construction:	32 feet of casing over 10 feet of screen; natural sand pack 25-40 feet; bentonite seal 25-28 feet; grouted 0-25 feet.

WELL MW-20B
(Drilled and Installed 1/29/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
45.0 - 46.5	97	Sand, medium, wet, dark grey.
50.0 - 51.5	40	Sand, some silt, trace gravel, wet, brown to grey.

Borehole Depth:	57 feet
Well Depth:	57 feet
Screened Interval:	42-57 feet
Well Construction:	44 feet of casing over 15 feet of screen; natural sand pack 38-57 feet; bentonite seal 36-38 feet; grouted 0-36 feet.

WELL MW-21A
(Drilled and Installed 1/10/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
5.0 - 6.5	2.2	Silt, some clay, dry, dark brown.
10.0 - 11.5	55.0	Silt, little fine sand, dry, dark brown, coal fragments.
15.0 - 16.5	56.0	Silt, little medium sand, dry, dark brown.
20.0 - 21.5	39.0	Silt and medium sand, dry, brown.
25.0 - 26.5	20.0	Sand, medium, some silt, wet, brown.
30.0 - 31.5	92.0	Sand, fine, wet, brown.
35.0 - 31.5	11.0	Sand, fine, trace silt, wet, brown.
40.0 - 41.5	19.0	Sand, fine to medium, trace silt, wet, brown.

Borehole Depth:	40 feet
Well Depth:	40 feet
Screened Interval:	30-40 feet
Well Construction:	32 feet of casing over 10 feet of screen; natural sand pack 24-40 feet; bentonite seal 22-24 feet; grouted 0-22 feet.

WELL MW-21B
(Drilled and Installed 1/11/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
45.0 - 46.5	119.0	Sand, medium little silt, wet, brown.
50.0 - 51.5	99.0	Sand, coarse, some gravel, wet, grey, coal fragments.
55.0 - 56.5	2.0	Sand, coarse, some gravel, wet, grey.

Borehole Depth: 58 feet
Well Depth: 58 feet
Screened Interval: 43-58 feet
Well Construction: 40 feet of casing over 15 feet of screen; natural sand pack 38-58 feet; bentonite seal 20-38 feet; grouted 0-20 feet.

WELL MW-22A
(Drilled and Installed 1/08/85)

Depth Interval (feet)	OVA Reading (ppm CH_4)	Description
5.0 - 6.5	ND	Sand, medium, some silt, moist, brown.
10.0 - 11.5	ND	Silt, some medium sand, moist, dark brown with black stringers.
15.0 - 16.5	ND	Sand, medium, wet, dark brown with black stringers.
20.0 - 21.5	ND	Sand, medium, some silt, moist, brown, coal fragments.
25.0 - 26.5	ND	Sand, medium, moist, brown.
30.0 - 31.5	19.0	Sand, medium, some silt, wet, brown.
35.0 - 36.5	3.0	Sand, medium, wet, light brown.
40.0 - 41.5	1.8	Sand, fine to medium, wet, light brown.

Borehole Depth:	40 feet
Water Encountered:	28 feet
Well Depth:	40 feet
Screened Interval:	30-40 feet
Well Construction:	32 feet of casing over 10 feet of screen; natural sand pack 26-40 feet; bentonite seal 24-26 feet; grouted 0-24 feet.

Dames · Converse · Murdoch · Inc. DCM

DRILLING LOG

WELL NUMBER: MW-1

LOCATION: Northeast corner of Emergency Overflow lagoon

SURFACE ELEVATION: See schedule

DRILLER: Gregory/Wright

COMPANY: Warren, George, Inc.

LOGGED BY: DJV/AJK

COMMENTS: Split spoon samples at 5 foot intervals. 4" I.D. 0.015" PVC screen at 13 - 53 ft. Developed with air

WELL OWNER: Monsanto, Inc.

ADDRESS: Nitro, WV

TOTAL DEPTH: 56 feet

STATIC WATER LEVEL: 570.08' DATE: 9/16/81

DRILLING METHOD: Mud Rotary

DATE DRILLED: September 16, 1981

SKETCH MAP

LOCATION: See Figure 1

DEPTH FROM SURFACE (FEET) GRAPHIC LOG	SAMPLES I.D. NUMBER	SAMPLES SPOON BLOWS	DESCRIPTION OF MATERIALS
0-10			Mottled tan to brown micaceous lignitic clay with sandy seams at 10ft.
10-12			Brown micaceous lignitic fine sandy silty clay.
12-19			Brown micaceous lignitic clayey fine sand
19-40			Brown micaceous lignitic silty clayey fine to medium grained sand, gravel layer at 20 ft.
40-45			Brown micaceous lignitic slightly clayey and silty fine to medium grained sand
45-52			Brown micaceous lignitic slightly clayey medium sand with sandstone gravel and coal fragments
52-56			Gray-green clay and saprolitic shale bedrock

Dames · Converse · Murdoch · Inc. DCM

DRILLING LOG

WELL NUMBER: ~~MW-2~~

LOCATION: Southeast corner of Emergency Overflow Lagoon

SURFACE ELEVATION: See Schedule

DRILLER: W. Martin

COMPANY: H.C. Nutting Company

LOGGED BY: DJV

COMMENTS: Split spoon samples at 5 foot intervals - 4" I.D. 0.015" PVC screen at 16.5 - 53.3 ft. Developed with air. Hole mudded at G.W.T.

WELL OWNER: Monsanto, Inc.

ADDRESS: Nitro, WV

TOTAL DEPTH: 53.5 feet

STATIC WATER LEVEL: 570.99' DATE: 9/16/81

DRILLING METHOD: Hollow Stem Auger

DATE DRILLED: September 1, 1981

SKETCH MAP

LOCATION: See Figure 1

DEPTH FROM SURFACE (FEET)	GRAPHIC LOG	SAMPLES I.D. NUMBER	SAMPLES SPOON BLOWS	DESCRIPTION OF MATERIALS
	0-1			Gravel fill with brown silty clay
	1-4			Brown micaceous lignitic fine sandy silty clay
	4-8			Dark brown micaceous lignitic clayey sand
	8-15			Dark brown micaceous lignitic fine grained sandy clay with some dark brown fine grained sand seams
	15-23			Brown micaceous lignitic fine to medium grained sand
	23-28			Slightly mottled dark brown very micaceous lignitic medium grained sand
	28-33			Mottled rust brown to gray brown micaceous lignitic silty fine to medium grained sand

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DRILLING LOG

WELL NUMBER: MW-2

LOCATION: Southeast corner of Emergency Overflow Lagoon

SURFACE ELEVATION: See Schedule

DRILLER: W. Martin

COMPANY: H.C. Nutting Company

LOGGED BY: DJV

COMMENTS: Split spoon samples at 5 foot intervals - 4" I.D. 0.015" PVC screen at 16.5 - 53.3 ft. Developed with air. Hole mudded at G.W.T.

WELL OWNER: Monsanto, Inc.

ADDRESS: Nitro, WV

TOTAL DEPTH: 53.5 feet

STATIC WATER LEVEL: 570.99' DATE: 9/16/81

DRILLING METHOD: Hollow Stem Auger

DATE DRILLED: September 1, 1981

SKETCH MAP

LOCATION: See Figure 1

GRAPHIC LOG	DEPTH FROM SURFACE (FEET)	SAMPLES I.D. NUMBER	SAMPLES SPOON BLOWS	DESCRIPTION OF MATERIALS
	0-1			Gravel fill with brown silty clay
	1-4			Brown micaceous lignitic fine sandy silty clay
	4-8			Dark brown micaceous lignitic clayey sand
	8-15			Dark brown micaceous lignitic fine grained sandy clay with some dark brown fine grained sand seams
	15-23			Brown micaceous lignitic fine to medium grained sand
	23-28			Slightly mottled dark brown very micaceous lignitic medium grained sand
	28-33			Mottled rust brown to gray brown micaceous lignitic silty fine to medium grained sand

WELL NUMBER: MW-2

DATE: 9/16/81

DEPTH (FEET)	GRAPHIC LOG	SAMPLE I.D. NUMBER	SAMPLE SPOON BLOWS	DESCRIPTION OF MATERIALS
	33-38			Brown micaceous lignitic slightly silty medium grained sand
	38-48			Brown-gray micaceous lignitic medium grained sand
	48-52			Dark brownish - gray micaceous lignitic medium grained sand with sh fragments
	52-55			Green saprolitic shale and fine grained samdstone

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DRILLING LOG

WELL NUMBER: MW-3

WELL OWNER: Monsanto, Inc.

LOCATION: Northeast corner of Surge Lagoon

ADDRESS: Nitro, WV

TOTAL DEPTH: 55 feet

SURFACE ELEVATION: See Schedule

STATIC WATER LEVEL: 570.50' DATE: 9/16/81

DRILLER: Gregory/Wright

DRILLING METHOD: Mud Rotary

COMPANY: Warren George, Inc.

DATE DRILLED: September 14, 1981

LOGGED BY: DJV/AJK

COMMENTS: Split spoon samples at 5 foot intervals. Shelby tube at 10 - 12 ft. 4" I.D. 0.015" PVC screen at 18-53 ft. Developed with air

SKETCH MAP

LOCATION: See Figure 1

DEPTH FROM SURFACE (FEET)	GRAPHIC LOG	SAMPLES I.D. NUMBER	SAMPLES SPOON BLOWS	DESCRIPTION OF MATERIALS
	0-1.5			Gravel fill with mottled gray to rust micaceous lignitic sandy clay
	1.5-8			Brown micaceous lignitic slightly sandy clay with some limestone pe
	8-23			Brown micaceous lignitic slightly clayey fine grained sand
	23-28			Brown micaceous lignitic clayey fine to medium grained sand with th
				clay lenses.
	28-33			Brown micaceous lignitic slightly clayey fine to medium grained
				sand with angular sandstone fragments.
	33-39			Dark brownish gray very micaceous very lignitic silty fine to mediu
				grained sand with oolitic limestone fragments

WELL NUMBER: MW-3

DATE: 9/16/81

DEPTH (FEET)	GRAPHIC LOG	SAMPLE I.D. NUMBER	SAMPLE SPOON BLOWS	DESCRIPTION OF MATERIALS
	39-44			Gray micaceous lignitic medium grained clayey sand with lenses of c
				and subangular sandstone fragments.
	44-48			Brownish gray micaceous lignitic silty medium to coarse grained san
	48-53			Dark gray to black micaceous lignitic medium grained sand with coal
				and sandstone fragments.
	53-55			Brown micaceous lignitic silty medium grained sand with decomposed
				sandstone gravel.

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DRILLING LOG

WELL NUMBER: MW-4A

LOCATION: Between Control Building and Limestone Pit

SURFACE ELEVATION: See Schedule

DRILLER: W. Martin

COMPANY: H.C. Nutting Company

LOGGED BY: DJV/AJK

COMMENTS: Split spoon samples at 5 foot intervals. 4" I.D. 0.015" PVC screen at 25-40 ft. Developed with air. Revert mud used. Hole mudded at G.W.T.

WELL OWNER: Monsanto, Inc.

ADDRESS: Nitro, WV

TOTAL DEPTH: 40 feet

STATIC WATER LEVEL: 568.95' DATE: 9/1

DRILLING METHOD: Hollow Stem Auger

DATE DRILLED: September 14, 1981

SKETCH MAP

LOCATION: See Figure 1

DEPTH FROM SURFACE (FEET)	GRAPHIC LOG	SAMPLES I.D. NUMBER	SAMPLES SPOON BLOWS	DESCRIPTION OF MATERIALS
	0-2			Gravel fill with clay
	2-6			Dark brown to black micaceous lignitic fine grained sandy clay fi
				with gravel fragments.
	6-13			Mottled tan to brown micaceous lignitic fine grained sandy clay
	13-18			Brown micaceous lignitic silty clay
	18-23			Brown to rust brown micaceous lignitic fine grained sandy clay
	23-28			Brown micaceous lignitic clay with thin seams of fine grained sanc
	28-38			Brown micaceous lignitic medium grained sand
	38-40			Brownish gray micaceous lignitic medium grained sand

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DRILLING LOG

WELL NUMBER: MW-4B

LOCATION: Between Control Building and Lagoon

SURFACE ELEVATION: See Schedule

DRILLER: W. Martin

COMPANY: H.C. Nutting Company

LOGGED BY: DJV

COMMENTS: Split spoon samples taken at 45, 50,55 feet. 4" I.D. 0.015" PVC screen at 41-58 ft. Developed with air

WELL OWNER: Monsanto, Inc.

ADDRESS: Nitro, WV

TOTAL DEPTH: 56 feet

STATIC WATER LEVEL: 568.33' DATE: 9/16/

DRILLING METHOD: Hollow Stem Auger

DATE DRILLED: September 4, 1981

SKETCH MAP

LOCATION: See Figure 1

DEPTH FROM SURFACE (FEET)	GRAPHIC LOG	SAMPLES I.D. NUMBER	SAMPLES SPOON BLOWS	DESCRIPTION OF MATERIALS
	0-2			Gravel fill with clay
	2-6			Dark brown to balck micaceous lignitic fine grained sandy clay with gravel fragments.
	6-13			Mottled tan to brown micaceous lignitic fine grained sandy clay
	13-18			Brown micaceous lignitic silty clay
	18-23			Brown to rust brown micaceous lignitic fine grained sandy clay
	23-28			Brown micaceous lignitic clay with thin seams of fine grained sand
	28-38			Brown micaceous lignitic medium grained sand
	38-40			Brownish gray micaceous lignitic medium grained sand.

WELL NUMBER: MW-4B

DATE: 9/15/81

DEPTH (FEET)	GRAPHIC LOG	SAMPLE I.D. NUMBER	SAMPLE SPOON BLOWS	DESCRIPTION OF MATERIALS
	40-48			Gray to black very micaceous very lignitic fine to medium grained with wood fragments
	48-53			Slightly mottled gray to brown micaceous silty medium grained san with lignite fragments.
	53-56			Dark brownish gray micaceous lignitic silty medium grained sand w decomposed sandstone and shale

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DRILLING LOG

WELL NUMBER: MW-5A

LOCATION: North of clarifier

SURFACE ELEVATION: See schedule

DRILLER: Gregory/Wright

COMPANY: Warren George Inc.

LOGGED BY: DJV/AKJ

COMMENTS: Split spoon samples taken at 5 ft. intervals. 4" I.D. 0.015" PVC screen set at 28-43 ft. Developed with air

WELL OWNER: Monsanto, Inc.

ADDRESS: Nitro, WV

TOTAL DEPTH: 43 feet

STATIC WATER LEVEL: 571.35' DATE: 9/16

DRILLING METHOD: Mud Rotary

DATE DRILLED: September 12, 1981

SKETCH MAP

LOCATION: See Figure 1

DEPTH FROM SURFACE (FEET)	GRAPHIC LOG	SAMPLES I.D. NUMBER	SAMPLES SPOON BLOWS	DESCRIPTION OF MATERIALS
	0-3			Brown micaceous lignitic fine grained sandy clay with some roots
	3-8			Brown micaceous lignitic clay
	8-29			Slightly mottled brown to buff brown micaceous lignitic well structured silty clay; very lignitic below 25 feet.
	29-34			Rust brown clay and brown micaceous lignitic fine to medium grain sand; clay and sand alternate in 1/4 to 1/2 inch layers.
	34-43			Dark to rust brown micaceous lignitic slightly clayey fine to medium grained sand.

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DRILLING LOG

WELL NUMBER: WM-5B

LOCATION: North of clarifier

SURFACE ELEVATION: See Schedule

DRILLER: Gregory/Wright

COMPANY: Warren George, Inc.

LOGGED BY: DJV/AJK

COMMENTS: Split spoon samples taken at 5 ft. intervals. 4" I.D. 0.015" PVC screen at 28-43 ft. Developed with air

WELL OWNER: Monsanto, Inc.

ADDRESS: Nitro, WV

TOTAL DEPTH: 58 feet

STATIC WATER LEVEL: 571.55' DATE: 9/16

DRILLING METHOD: Mud Rotary

DATE DRILLED: September 12, 1981

SKETCH MAP

LOCATION: See Figure 1

DEPTH FROM SURFACE (FEET)	GRAPHIC LOG	SAMPLES I.D. NUMBER	SAMPLES SPOON BLOWS	DESCRIPTION OF MATERIALS
0-3				Brown micaceous lignitic fine grained sandy clay with some root
3-8				Brown micaceous lignitic clay
8-29				Slightly mottled brown to buff brown micaceous lignitic well structured silty clay; very lignitic below 25 feet
29-34				Rust brown Clay and brown micaceous lignitic fine to medium gra sand; clay and sand alternate in 1/4 to 1/2 inch layers
34-43				Dark to rust brown micaceous lignitic slightly clayey fine to medium grained sand
43-48				Organe to rust brown micaceous lignitic slightly silty medium grained sand

PAGE: 2 of 2

WELL NUMBER: MW-5B

DATE: 9/12/81

DEPTH (FEET)	GRAPHIC LOG	SAMPLE I.D. NUMBER	SAMPLE SPOON BLOWS	DESCRIPTION OF MATERIALS
	48-53			Dark gray lignitic medium grained sand with lenses of brown clay and subangular sandstone fragments
	53-58			Brown micaceous silty medium grained sand with decomposed sandstone gravel

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DRILLING LOG

WELL NUMBER: MW-6

LOCATION: East of southeast corner of Aerobic Digester

SURFACE ELEVATION: See schedule

DRILLER: W. Martin

COMPANY: H.C. Nutting Company

LOGGED BY: DJV/AJK

COMMENTS: Split spoon samples taken at 5 ft. intervals. 4" I.D. 0.015" PVC screen set at 18-53 ft. Developed with air. Hole mudded at G.W.T.

WELL OWNER: Monsanto, Inc.

ADDRESS: Nitro, WV

TOTAL DEPTH: 53 feet

STATIC WATER LEVEL: 569.39' DATE: 9/16/8

DRILLING METHOD: Hollow Stem Auger

DATE DRILLED: September 3, 1981

SKETCH MAP

LOCATION: See Figure 1

DEPTH FROM SURFACE (FEET)	GRAPHIC LOG	SAMPLES I.D. NUMBER	SAMPLES SPOON BLOWS	DESCRIPTION OF MATERIALS
	0-3			Brown micaceous fine grained sandy silty clay with roots; possibl fill
	3-8			Slightly mottled brown micaceous lignitic well-structured clay
	8-13			Brown micaceous lignitic clay with thin seams of fine to medium grained sand.
	13-20	5		Brown micaceous lignitic slightly clayey medium to coarse grained sand
	20.5-23			Brown micaceous lignitic fine to medium sand
	23-33			Dark to light brown micaceous silty fine to medium grained sand with angular friable sandstone fragments

WELL NUMBER: MW-6

DATE: 9/3/81

DEPTH (FEET)	GRAPHIC LOG	SAMPLE I.D. NUMBER	SAMPLE SPOON BLOWS	DESCRIPTION OF MATERIALS
	33-38			Gray-brown micaceous lignitic fine to medium grained sand
	38-48			Light brown to gray micaceous fine to medium grained sand with trace gray sandstone pebbles.
	48-53			Light to dark brown micaceous medium grained sand with friable sandstone pebbles
	53			Mottled purple and gray Clay

Geraghty & Miller, Inc.

WELL LOG

PROJECT Monsanto, RCRA Facility DATE 11/28/85 SHEET 1 OF 2

LOCATION Nitro, West Virginia DRILLING CONTRACTOR Pennsylvania Drilling

WELL NUMBER MW-7a, b, c DRILLING METHOD Hollow-Stem Auger, Roller Cone

SAMPLE DESCRIBED BY Robert L. Wright SAMPLING METHOD Split Spoon and Core Barr

SAMPLE NUMBER	SAMPLE DESCRIPTION	DRILLING COMMENTS	DEPTH INTERVAL (FEET)	THICKNESS (FEET)
1	Clay, some silt, trace medium sand, damp, brown.		5.0- 6.5	
2	Clay and silt, some medium sand, damp, brown.		10.0-11.5	20
3	Silt and sand, medium, moist, brown.		15.0-16.5	
4	Sand, fine to medium, some silt, wet, brown.		20.0-21.5	
5	Sand, medium, some silt, wet, brown; loose to medium dense layer of brown silt at 25.5 feet.	Water Encountered at 24 feet	25.0-26.5	10
6	Sand, medium, some silt, wet, gray; layer of rust fine sand at 31 feet; layer of medium gray sand 31 to 31.5 feet.		30.0-31.5	
7	Sand, medium, trace silt, wet, gray.		35.0-36.5	
8	Sand, medium, trace silt, gray to brown, wet.		40.0-41.5	26.5
9	Sand, medium, trace silt, wet, gray to brown; lense of gray sandy silt at 46 feet.		45.0-46.5	
10	Sand, medium, wet, gray.		50.0-51.5	

Geraghty & Miller, Inc.

WELL LOG

PROJECT Monsanto, RCRA Facility DATE 11/28/85 SHEET 2 OF 2

LOCATION Nitro, West Virginia DRILLING CONTRACTOR Pennsylvania Drilli

WELL NUMBER MW-7a, b, c DRILLING METHOD Hollow-Stem Auger, Roller Cone

SAMPLE DESCRIBED BY Robert L. Wright SAMPLING METHOD Split Spoon and Core Ba

SAMPLE NUMBER	SAMPLE DESCRIPTION	DRILLING COMMENTS	DEPTH INTERVAL (FEET)	THICKNESS (FEET)
11	Sand, medium to coarse, wet, gray; pieces of gravel, layer of mottled brown, purple clay at 56 feet.		55.0-56.5	
12	Red to purple clay.	Core barrel sample taken 60-72 feet.	56.5-62.5	6
13	Gray siltstone, hard.	Hole reamed with 4 7/8 inch roller bit.	62.5-72.0	9.5

Geraghty & Miller, Inc.

WELL LOG

PROJECT Monsanto, RCRA Facility DATE 12/04/85 SHEET 1 OF 2

LOCATION Nitro, West Virginia DRILLING CONTRACTOR Pennsylvania Drilling

WELL NUMBER MW-8a, b, c DRILLING METHOD Hollow Stem Auger, Roller Bit

SAMPLE DESCRIBED BY Robert L. Wright SAMPLING METHOD Split Spoon, Cuttings

SAMPLE NUMBER	SAMPLE DESCRIPTION	DRILLING COMMENTS	DEPTH INTERVAL (FEET)	THICKNESS (FEET)
1	Silt and clay, little fine sand, dry, brown.		5.0- 6.5	
2	Silt, some medium sand, damp, brown.		10.0-11.5	15
3	Sand, medium, little silt, damp, brown; silt with some fine sand from 15 to 16 feet.		15.0-16.5	
4	Sand, medium, little silt, wet, brown; lense of sandy silt at 20 to 21.2 feet.	Water Encountered at 20 feet	20.0-21.5	
5	Sand, medium, little silt, little medium gravel, wet, brown.		25.0-26.5	25
6	Sand, fine to medium, trace silt, little medium gravel, wet, brown.		30.0-31.5	
7	Sand, medium, trace silt, wet, brown.		35.0-36.5	
8	Sand, medium, trace silt, pieces of large gravel, wet, gray, layer of sandstone at 41.5 feet.		40.0-41.5	12
9	Sand, medium, trace silt, wet, gray, lense of gray silt at 45.5 feet.		45.0-46.5	

Geraghty & Miller, Inc.

WELL LOG

PROJECT Monsanto, RCRA Facility DATE 12/04/85 SHEET 2 OF 2

LOCATION Nitro, West Virginia DRILLING CONTRACTOR Pennsylvania Drilli

WELL NUMBER MW-8a, b, c DRILLING METHOD Hollow Stem Auger, Roller Bit

SAMPLE DESCRIBED BY Robert L. Wright SAMPLING METHOD Split Spoon, Cuttings

SAMPLE NUMBER	SAMPLE DESCRIPTION	DRILLING COMMENTS	DEPTH INTERVAL (FEET)	THICKNESS (FEET)
10	Sand, medium, trace silt, wet, gray.		50.0-51.5	
11	Red to purple clay.	Hole drilled with roller bit through hollow stem augers.	52.0-55.0	3
12	Siltstone, gray		55.0-71.0	16

Geraghty & Miller, Inc.

WELL LOG

PROJECT Monsanto, RCRA Facility DATE 12/10/85 SHEET 1 OF 1

LOCATION Nitro, West Virginia DRILLING CONTRACTOR Pennsylvania Drillin

WELL NUMBER MW-9a, b, c DRILLING METHOD Hollow Stem Auger, Wash Casing, Roller Bit

SAMPLE DESCRIBED BY Robert L. Wright SAMPLING METHOD Split Spoon, Core Barrel

SAMPLE NUMBER	SAMPLE DESCRIPTION	DRILLING COMMENTS	DEPTH INTERVAL (FEET)	THICKNESS (FEET)
1	Silt, trace fine sand, gray, moist.		5.0- 6.5	
2	Silt, some clay, damp, brown to gray.		10.0-11.5	20
3	Clay, some silt, dry, mottled rust and gray, layer of gray medium sand at 15 feet.		15.0-16.5	
4	Sand, some silt, medium, dry, brown.	Water Encountered at 26.5 feet	20.0-21.5	17
5	Sand, medium, moist, brown.		25.0-26.5	
6	Sand, medium, wet, brown, layer of black silty material at 31 feet.		30.0-31.5	
7	Sand, medium, trace silt, wet, gray, pieces of coal at 40 feet.		37.0-38.5	
8	Sand, fine to medium, trace silt, wet, gray, lense of coal at 49 feet.		48.0-49.5	29
9	Silt and clay, some medium sand, some gravel, wet, gray to rust.		59.0-60.5	
10	Red to purple clay and pieces of shale.	Sample taken with core barrel 66-80 feet.	66.0-68.5	2.5
11	Gray siltstone.		68.5-80.0	11.5

Geraghty & Miller, Inc.

WELL LOG

PROJECT Monsanto, RCRA Facility DATE 1/15/85 SHEET 1 OF 2

LOCATION Nitro, West Virginia DRILLING CONTRACTOR Pennsylvania Drilli

WELL NUMBER MW-10a, b, c DRILLING METHOD Hollow Stem Auger, Roller Bit

SAMPLE DESCRIBED BY Robert L. Wright SAMPLING METHOD Split Spoon, Cuttings

SAMPLE NUMBER	SAMPLE DESCRIPTION	DRILLING COMMENTS	DEPTH INTERVAL (FEET)	THICKNESS (FEET)
1	Silt and clay, trace medium sand, dry, brown.		5.0- 6.5	10
2	Sand, medium, little silt, brown, dry.		10.0-11.5	
3	Sand, medium, trace silt, dry, brown.	Water Encountered at 19 feet.	15.0-16.5	10
4	Silt and clay, some medium sand, wet, brown with rust, piece of large gravel at 21.5 feet.		20.0-21.5	5
5	Sand, medium, trace silt, brown, wet, layer of gray silty sand at 25.5 to 26 feet.		25.0-26.5	
6	Sand, medium, trace silt, brown, wet.		30.0-31.5	15
7	Sand, medium, trace silt, wet, light gray to brown, lense of gray silty sand at 35.5 to 36 feet.		35.0-36.5	
8	Sand, medium, trace silt, wet, light gray.		40.0-41.5	
9	Sand, medium to coarse, little silt, wet, gray.		45.0-46.5	14.5

Geraghty & Miller, Inc.

WELL LOG

PROJECT Monsanto, RCRA Facility DATE 1/15/85 SHEET 2 OF 2

LOCATION Nitro, West Virginia DRILLING CONTRACTOR Pennsylvania Drilli

WELL NUMBER MW-10a, b, c DRILLING METHOD Hollow Stem Auger, Roller Bit

SAMPLE DESCRIBED BY Robert L. Wright SAMPLING METHOD Split Spoon, Cuttings

SAMPLE NUMBER	SAMPLE DESCRIPTION	DRILLING COMMENTS	DEPTH INTERVAL (FEET)	THICKNESS (FEET)
10	Sand, medium to coarse, wet, gray, pieces of coal.		50.0-51.5	
11	Sand, medium to coarse, pieces of coal, wet, gray, lense of silty, gray sand with pieces of gravel at 54.3 feet.		53.0-54.5	
12	Gray siltstone.	Drilled with 3 7/8 inch roller bit through 4 inch steel casing.	54.5-70.0	16

Geraghty & Miller, Inc.

WELL LOG

PROJECT Monsanto, RCRA Facility DATE 1/23/85 SHEET 1 OF 1

LOCATION Nitro, West Virginia DRILLING CONTRACTOR Pennsylvania Drillin

WELL NUMBER MW-11a, b, c DRILLING METHOD Hollow Stem Auger, Roller Bit

SAMPLE DESCRIBED BY Robert L. Wright SAMPLING METHOD Split Spoon, Cuttings

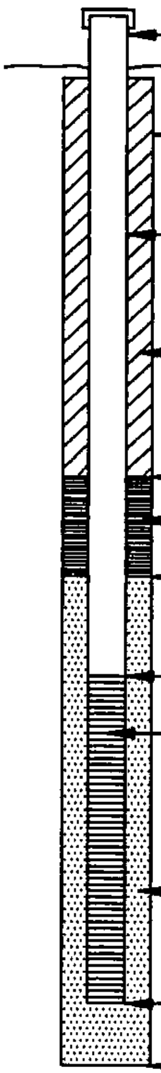
SAMPLE NUMBER	SAMPLE DESCRIPTION	DRILLING COMMENTS	DEPTH INTERVAL (FEET)	THICKNESS (FEET)
1	Clay and silt, dry, rust, pieces of wood, lenses of silty sand.		5.0- 6.5	15
2	Sand and silt, fine to medium, moist, brown.		10.0-11.5	
3	Sand, medium, trace silt, damp, brown.		15.0-16.5	
4	Sand, medium, trace silt, moist, brown.	Water Encountered at 22 feet.	20.0-21.5	15
5	Sand, medium, little silt, wet, brown.		25.0-26.5	
6	Sand, medium, some silt, wet, brown to gray.		30.0-31.5	
7	Sand, medium, little silt, wet, gray.		35.0-36.5	24
8	Sand, medium, trace silt, wet, gray.		40.0-41.5	
9	Sand, medium, trace silt, wet, gray.		45.0-46.5	
10	Silt, some fine sand, wet, gray, layer of gray, medium sand at 51-51.5 feet.		50.0-51.5	
11	Saprolite, sand and gravel, trace silt, cemented, wet, gray.	Drilled with augers through roller bit	54.0-58.0	4
12	Gray siltstone, hard.		58.0-74.0	16

APPENDIX B

WELL CONSTRUCTION FORMS

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG



~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

7 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

8 FT. BOTTOM OF SEAL

9 FT. TOP OF SCREEN

SCREEN TYPE PVC
15 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

24 FT. BOTTOM OF SCREEN

24 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03

WELL NO. WT-15A PERMIT NO.

TOWN/CITY Nitro

COUNTY Kanawha STATE West Virginia

WELL LOCATION Waste Treatment Plant Area

LAND-SURFACE ELEVATION 587.1 ☐ SURVEYED ☑ ESTIMATED

MEASURING POINT ELEVATION 589.08 ☑ SURVEYED ☐ ESTIMATED

MEASURING POINT LOCATION Top of PVC Casing

INSTALLATION DATE(S) 8/27/94

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR CTL Engineering, Inc.

DRILLING FLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

FLUID LOSS DURING DRILLING NA GALLONS

WATER REMOVED DURING DEVELOPMENT 55 GALLONS

STATIC DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DURATION -- HOURS

YIELD -- GPM DATE 9/2/94

SPECIFIC CAPACITY GPM/FT.

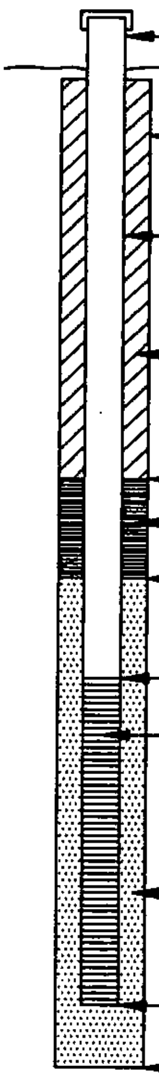
WELL PURPOSE Ground-Water Quality Monitoring

REMARKS

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG



~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

14 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

16 FT. BOTTOM OF SEAL

18 FT. TOP OF SCREEN

SCREEN TYPE PVC
20 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

38 FT. BOTTOM OF SCREEN

40 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03

WELL NO. MW-22R PERMIT NO. ______

TOWN/CITY Nitro

COUNTY Kanawha STATE West Virginia

WELL LOCATION Process Area

LAND-SURFACE ELEVATION 594.0 ☐ SURVEYED ☑ ESTIMATED

MEASURING POINT ELEVATION 596.53 ☑ SURVEYED ☐ ESTIMATED

MEASURING POINT LOCATION Top of PVC Casing

INSTALLATION DATE(S) 8/26/94

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR CTL Engineering, Inc.

DRILLING FLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

FLUID LOSS DURING DRILLING NA GALLONS

WATER REMOVED DURING DEVELOPMENT 55 GALLONS

STATIC DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DURATION -- HOURS

YIELD -- GPM DATE 9/2/94

SPECIFIC CAPACITY ______ GPM/FT.

WELL PURPOSE Ground-Water Quality Monitoring

REMARKS ______

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG

~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

16 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

18 FT. BOTTOM OF SEAL

19.8 FT. TOP OF SCREEN

SCREEN TYPE PVC
15 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

34.8 FT. BOTTOM OF SCREEN

35 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03

WELL NO. MW-23A PERMIT NO.

TOWN/CITY Nitro

COUNTY Kanawha STATE West Virginia

WELL LOCATION Process Area

LAND-SURFACE ELEVATION 597.3 ☐ SURVEYED ☑ ESTIMATED

MEASURING POINT ELEVATION 598.82 ☑ SURVEYED ☐ ESTIMATED

MEASURING POINT LOCATION Top of PVC Casing

INSTALLATION DATE(S) 8/24/94

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR CTL Engineering, Inc.

DRILLINGFLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

FLUID LOSS DURING DRILLING NA GALLONS

WATER REMOVED DURING DEVELOPMENT 55 GALLONS

STATIC DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DURATION -- HOURS

YIELD -- GPM DATE 9/2/94

SPECIFIC CAPACITY GPM/FT.

WELLPURPOSE Ground-Water Quality Monitoring

REMARKS

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG

~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

9 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

12 FT. BOTTOM OF SEAL

15 FT. TOP OF SCREEN

SCREEN TYPE PVC
20 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

35 FT. BOTTOM OF SCREEN

35 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03
WELL NO. MW-24A PERMIT NO.
TOWN/CITY Nitro
COUNTY Kanawha STATE West Virginia
WELL LOCATION Process Area
LAND-SURFACE ELEVATION 592.1 ☐ SURVEYED ☑ ESTIMATED
MEASURING POINT ELEVATION 594.58 ☑ SURVEYED ☐ ESTIMATED
MEASURING POINT LOCATION Top of PVC casing

INSTALLATION DATE(S) 8/25/94
DRILLING METHOD Hollow stem auger
DRILLING CONTRACTOR CTL Engineering, Inc.
DRILLING FLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

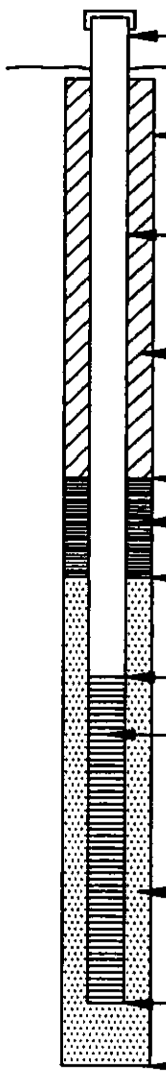
FLUID LOSS DURING DRILLING NA GALLONS
WATER REMOVED DURING DEVELOPMENT 55 GALLONS
STATIC DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DURATION -- HOURS
YIELD -- GPM DATE 9/2/94
SPECIFIC CAPACITY GPM/FT.
WELL PURPOSE Ground-Water Quality Monitoring

REMARKS

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG



~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

17.4 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

20.8 FT. BOTTOM OF SEAL

23 FT. TOP OF SCREEN

SCREEN TYPE PVC
20 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

43 FT. BOTTOM OF SCREEN

45 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03

WELL NO. PZ-1 PERMIT NO. ____

TOWN/CITY Nitro

COUNTY Kanawha STATE West Virginia

WELL LOCATION Process Area

LAND-SURFACE ELEVATION 596.1 ☐ SURVEYED ☑ ESTIMATED

MEASURING POINT ELEVATION 598.68 ☑ SURVEYED ☐ ESTIMATED

MEASURING POINT LOCATION Top of PVC casing

INSTALLATION DATE(S) 8/25/94

DRILLING METHOD Hollow stem auger

DRILLING CONTRACTOR CTL Engineering, Inc.

DRILLINGFLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

FLUID LOSS DURING DRILLING NA GALLONS

WATER REMOVED DURING DEVELOPMENT 55 GALLONS

STATIC DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DURATION -- HOURS

YIELD -- GPM DATE 9/2/94

SPECIFIC CAPACITY ____ GPM/FT.

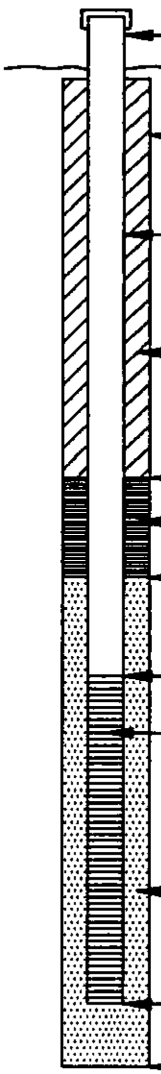
WELLPURPOSE Aquifer testing

REMARKS ____

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG



~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

18 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

21 FT. BOTTOM OF SEAL

23 FT. TOP OF SCREEN

SCREEN TYPE PVC
20 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

43 FT. BOTTOM OF SCREEN

45 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03
WELL NO. PZ-2 PERMIT NO.
TOWN/CITY Nitro
COUNTY Kanawha STATE West Virginia
WELL LOCATION Process Area
LAND-SURFACE ELEVATION 596.2 ☐ SURVEYED ☑ ESTIMATED
MEASURING POINT ELEVATION 598.78 ☑ SURVEYED ☐ ESTIMATED
MEASURING POINT LOCATION Top of PVC casing

INSTALLATION DATE(S) 8/25/94
DRILLING METHOD Hollow stem auger
DRILLING CONTRACTOR CTL Engineering, Inc.
DRILLING FLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

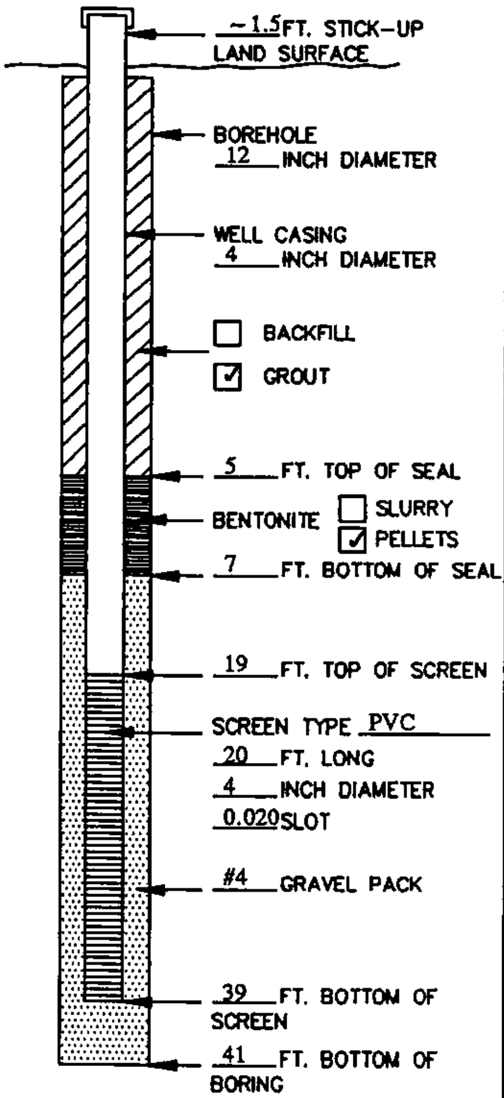
FLUID LOSS DURING DRILLING NA GALLONS
WATER REMOVED DURING DEVELOPMENT 55 GALLONS
STATIC DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DURATION -- HOURS
YIELD -- GPM DATE 9/2/94
SPECIFIC CAPACITY GPM/FT.
WELL PURPOSE Aquifer testing

REMARKS

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03

WELL NO. PZ-3 PERMIT NO. ____

TOWN/CITY Nitro

COUNTY Kanawha STATE West Virginia

WELL LOCATION Waste Treatment Plant Area

LAND-SURFACE ELEVATION 587.4 ☐ SURVEYED ☑ ESTIMATED

MEASURING POINT ELEVATION 589.99 ☑ SURVEYED ☐ ESTIMATED

MEASURING POINT LOCATION Top of PVC casing

INSTALLATION DATE(S) 8/29/94

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR CTL Engineering, Inc.

DRILLING FLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

FLUID LOSS DURING DRILLING NA GALLONS

WATER REMOVED DURING DEVELOPMENT 55 GALLONS

STATIC DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DURATION -- HOURS

YIELD -- GPM DATE 9/2/94

SPECIFIC CAPACITY ____ GPM/FT.

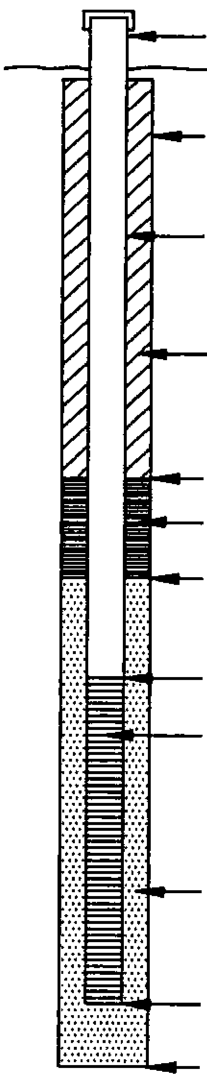
WELL PURPOSE Aquifer Testing

REMARKS ____

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG



~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

15 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

17.2 FT. BOTTOM OF SEAL

20 FT. TOP OF SCREEN

SCREEN TYPE PVC
20 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

40 FT. BOTTOM OF SCREEN

41 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03
WELL NO. PZ-4 PERMIT NO.
TOWN/CITY Nitro
COUNTY Kanawha STATE West Virginia
WELL LOCATION Waste Treatment Plant Area
LAND-SURFACE ELEVATION 587.7 ☐ SURVEYED ☑ ESTIMATED
MEASURING POINT ELEVATION 590.21 ☑ SURVEYED ☐ ESTIMATED
MEASURING POINT LOCATION Top of PVC Casing

INSTALLATION DATE(S) 8/29/94
DRILLING METHOD Hollow Stem Auger
DRILLING CONTRACTOR CTL Engineering, Inc.
DRILLINGFLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

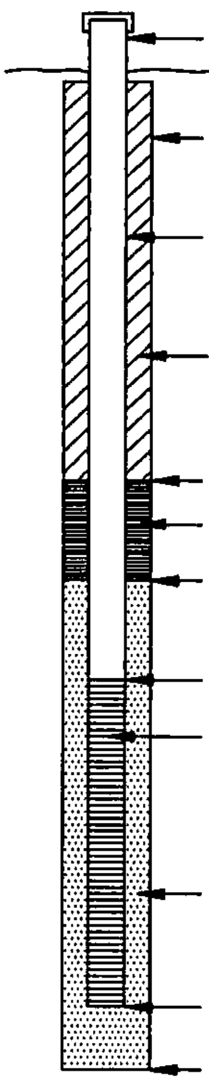
FLUID LOSS DURING DRILLING NA GALLONS
WATER REMOVED DURING DEVELOPMENT 55 GALLONS
STATIC DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DURATION -- HOURS
YIELD -- GPM DATE 9/2/94
SPECIFIC CAPACITY GPM/FT.
WELLPURPOSE Aquifer Testing

REMARKS

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL
CONSTRUCTION LOG



~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

17.17 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

20.5 FT. BOTTOM OF SEAL

22.75 FT. TOP OF SCREEN

SCREEN TYPE PVC
20 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

42.75 FT. BOTTOM OF SCREEN

45 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03
WELL NO. TW-1 PERMIT NO.
TOWN/CITY Nitro
COUNTY Kanawha STATE West Virginia
WELL LOCATION Process Area
LAND-SURFACE ELEVATION 597.1 ☐ SURVEYED ☑ ESTIMATED
MEASURING POINT ELEVATION 598.64 ☑ SURVEYED ☐ ESTIMATED
MEASURING POINT LOCATION Top of PVC Casing

INSTALLATION DATE(S) 8/24/94
DRILLING METHOD Hollow Stem Auger
DRILLING CONTRACTOR CTL Engineering, Inc.
DRILLINGFLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

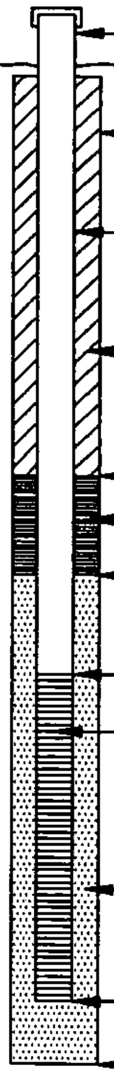
FLUID LOSS DURING DRILLING NA GALLONS
WATER REMOVED DURING DEVELOPMENT 55 GALLONS
STATIC DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DURATION -- HOURS
YIELD -- GPM DATE 9/2/94
SPECIFIC CAPACITY GPM/FT.
WELLPURPOSE Aquifer Testing

REMARKS

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG



~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

15 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

17 FT. BOTTOM OF SEAL

20 FT. TOP OF SCREEN

SCREEN TYPE PVC
20 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

38 FT. BOTTOM OF SCREEN

42 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03
WELL NO. TW-2 PERMIT NO. ______
TOWN/CITY Nitro
COUNTY Kanawha STATE West Virginia
WELL LOCATION Waste Treatment Plant Area
LAND-SURFACE ELEVATION 586.9 ☐ SURVEYED ☑ ESTIMATED
MEASURING POINT ELEVATION 589.48 ☑ SURVEYED ☐ ESTIMATED
MEASURING POINT LOCATION Top of PVC Casing

INSTALLATION DATE(S) 8/29/94
DRILLING METHOD Hollow Stem Auger
DRILLING CONTRACTOR CTL Engineering, Inc.
DRILLING FLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

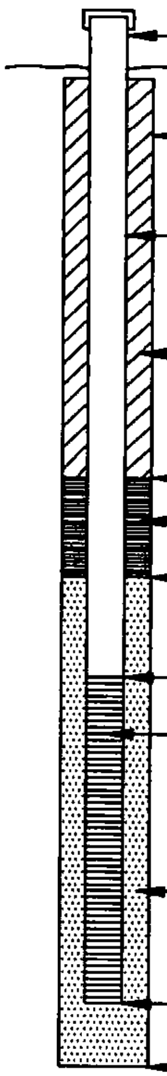
FLUID LOSS DURING DRILLING NA GALLONS
WATER REMOVED DURING DEVELOPMENT 55 GALLONS
STATIC DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DEPTH TO WATER -- FEET BELOW M.P.
PUMPING DURATION -- HOURS
YIELD -- GPM DATE 9/2/94
SPECIFIC CAPACITY ______ GPM/FT.
WELL PURPOSE Aquifer Testing

REMARKS ______

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG



~1.5 FT. STICK-UP
LAND SURFACE

BOREHOLE
12 INCH DIAMETER

WELL CASING
4 INCH DIAMETER

☐ BACKFILL
☑ GROUT

10 FT. TOP OF SEAL

BENTONITE ☐ SLURRY ☑ PELLETS

12 FT. BOTTOM OF SEAL

14 FT. TOP OF SCREEN

SCREEN TYPE PVC
20 FT. LONG
4 INCH DIAMETER
0.020 SLOT

#4 GRAVEL PACK

34 FT. BOTTOM OF SCREEN

34 FT. BOTTOM OF BORING

NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03

WELL NO. WT-13A PERMIT NO.

TOWN/CITY Nitro

COUNTY Kanawha STATE West Virginia

WELL LOCATION Waste Treatment Plant Area

LAND-SURFACE ELEVATION 588.8 ☐ SURVEYED ☑ ESTIMATED

MEASURING POINT ELEVATION 590.82 ☑ SURVEYED ☐ ESTIMATED

MEASURING POINT LOCATION Top of PVC Casing

INSTALLATION DATE(S) 8/28/94

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR CTL Engineering, Inc.

DRILLING FLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

FLUID LOSS DURING DRILLING NA GALLONS

WATER REMOVED DURING DEVELOPMENT 55 GALLONS

STATIC DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DURATION -- HOURS

YIELD -- GPM DATE 9/2/94

SPECIFIC CAPACITY GPM/FT.

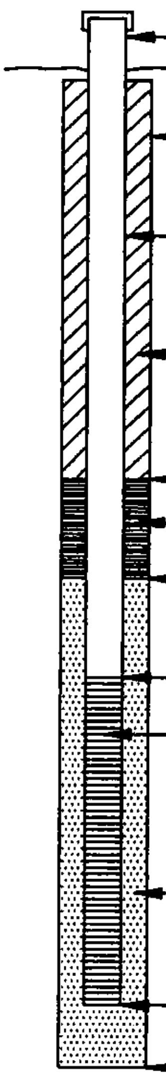
WELL PURPOSE Ground-Water Quality Monitoring

REMARKS

SIGNATURE Scott Anderson

ROUX ASSOCIATES, INC.
Consulting Ground-Water Geologists

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET BELOW GROUND SURFACE.

PROJECT NAME Monsanto Nitro NUMBER 06619J03

WELL NO. WT-14A PERMIT NO. ____

TOWN/CITY Nitro

COUNTY Kanawha STATE West Virginia

WELL LOCATION Waste Treatment Plant Area

LAND-SURFACE ELEVATION 591.5 ☐ SURVEYED ☑ ESTIMATED

MEASURING POINT ELEVATION 593.57 ☑ SURVEYED ☐ ESTIMATED

MEASURING POINT LOCATION Top of PVC Casing

INSTALLATION DATE(S) 08/27/94

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR CTL Engineering, Inc.

DRILLINGFLUID None

DEVELOPMENT TECHNIQUES(S) AND DATE(S)
Hand bailing

FLUID LOSS DURING DRILLING NA GALLONS

WATER REMOVED DURING DEVELOPMENT 55 GALLONS

STATIC DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DEPTH TO WATER -- FEET BELOW M.P.

PUMPING DURATION -- HOURS

YIELD -- GPM DATE 9/2/94

SPECIFIC CAPACITY ____ GPM/FT.

WELLPURPOSE Ground-Water Quality Monitoring

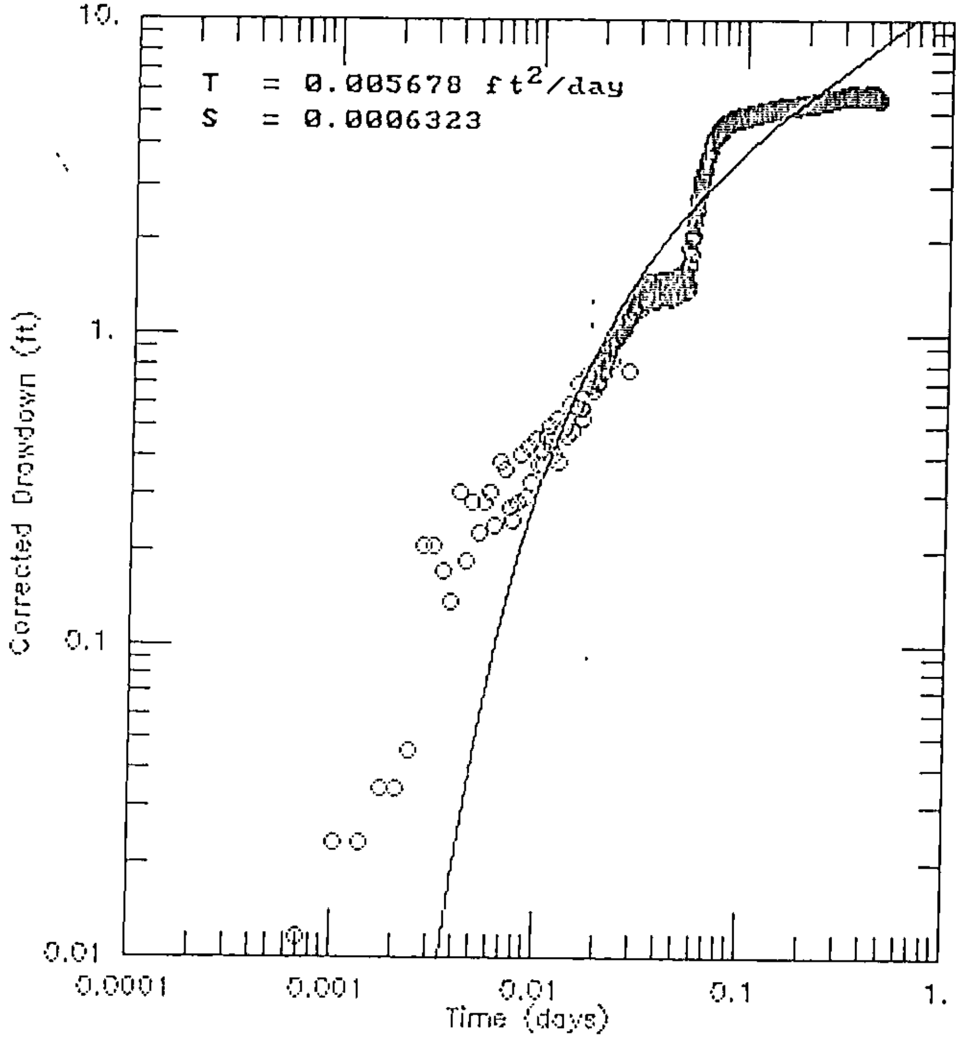
REMARKS ____

SIGNATURE Scott Andersen

APPENDIX C

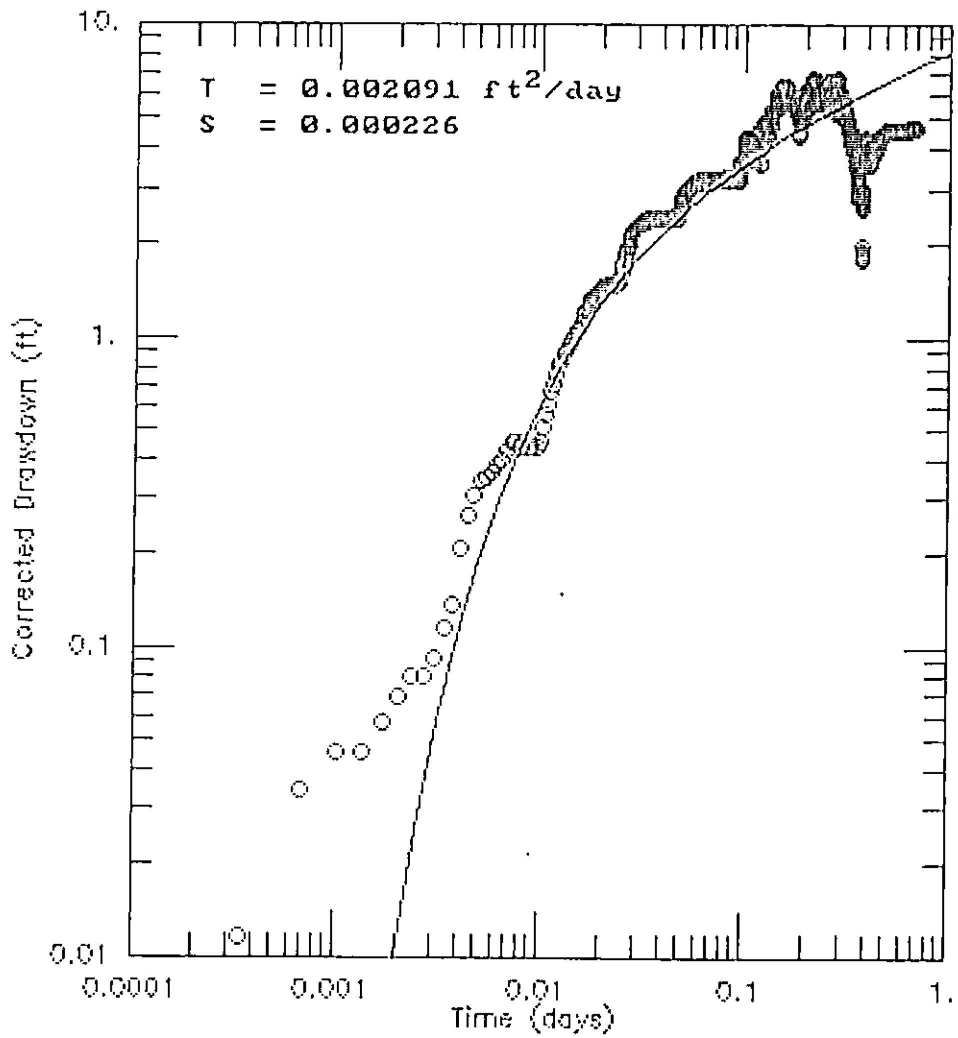
AQUIFER TEST PLOTS

TW-2 24-HOUR AQUIFER TEST



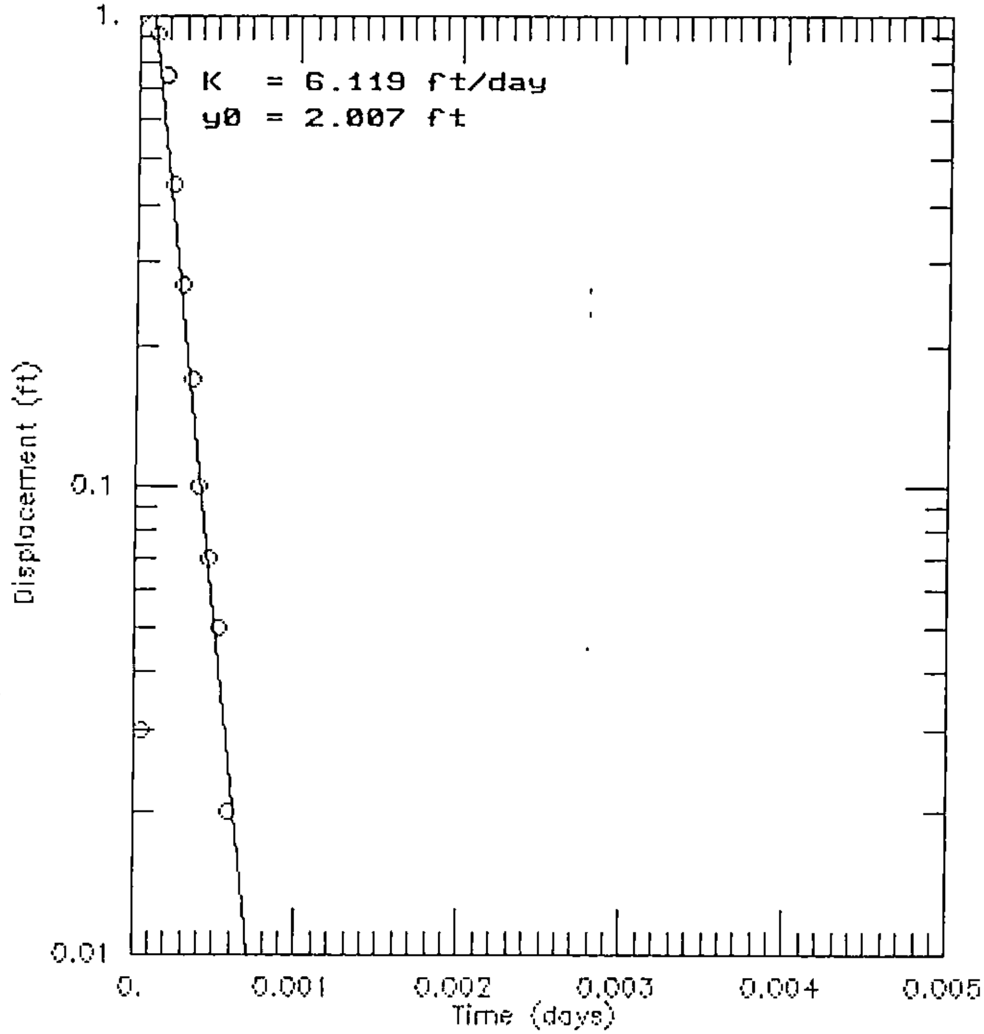
Note: T&S results are unreliable due to fluctuating pumping rate conditions.

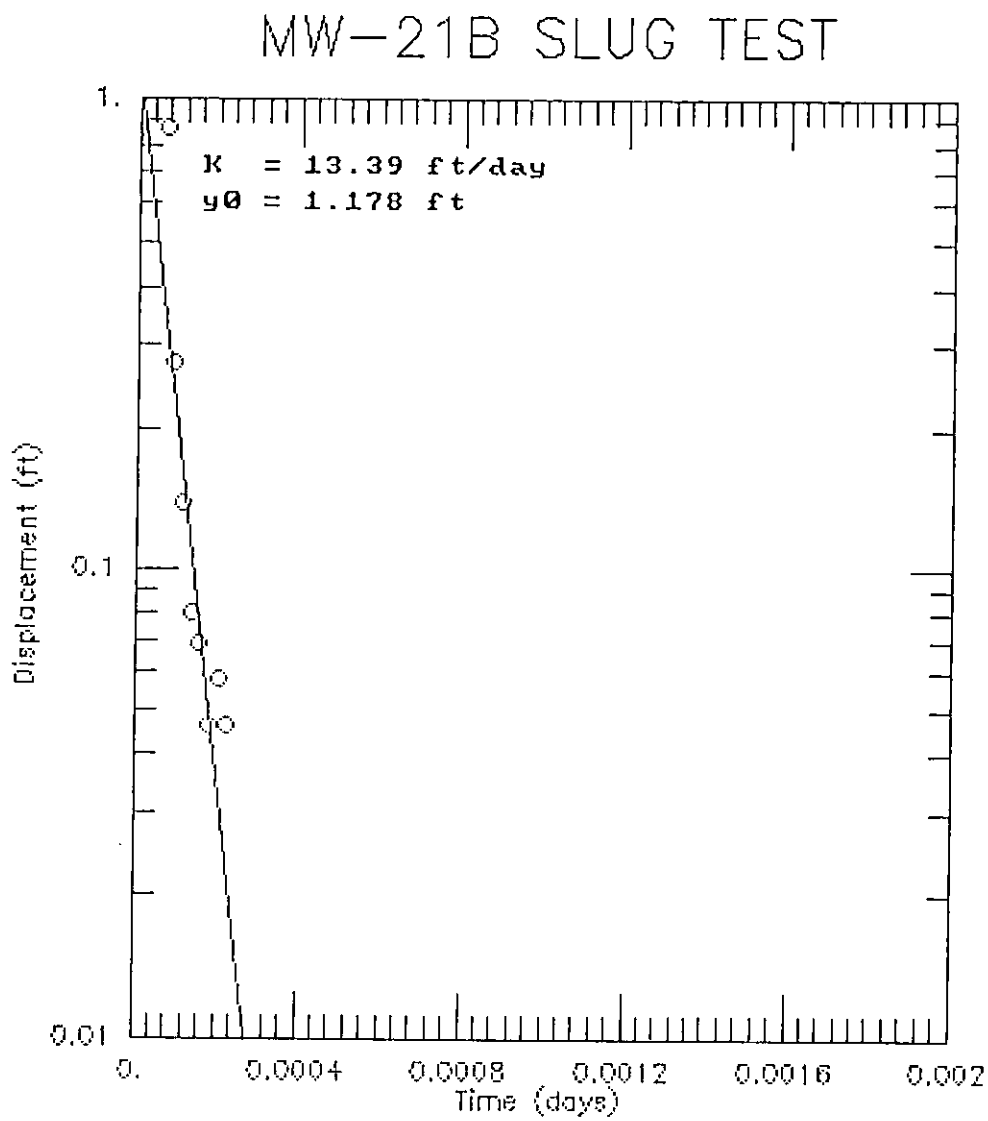
TW-1 24-HOUR AQUIFER TEST

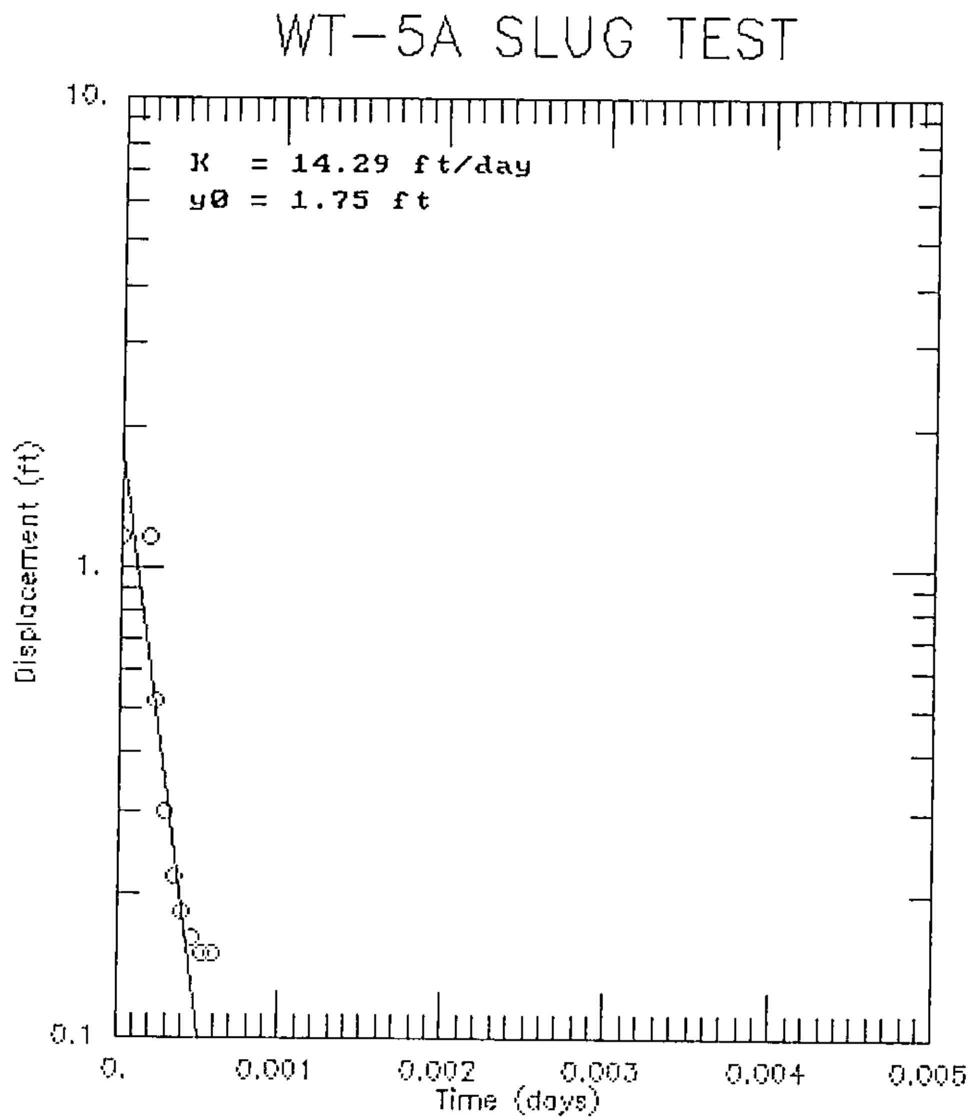


Note: T&S results are unreliable due to fluctuating pumping rate conditions.

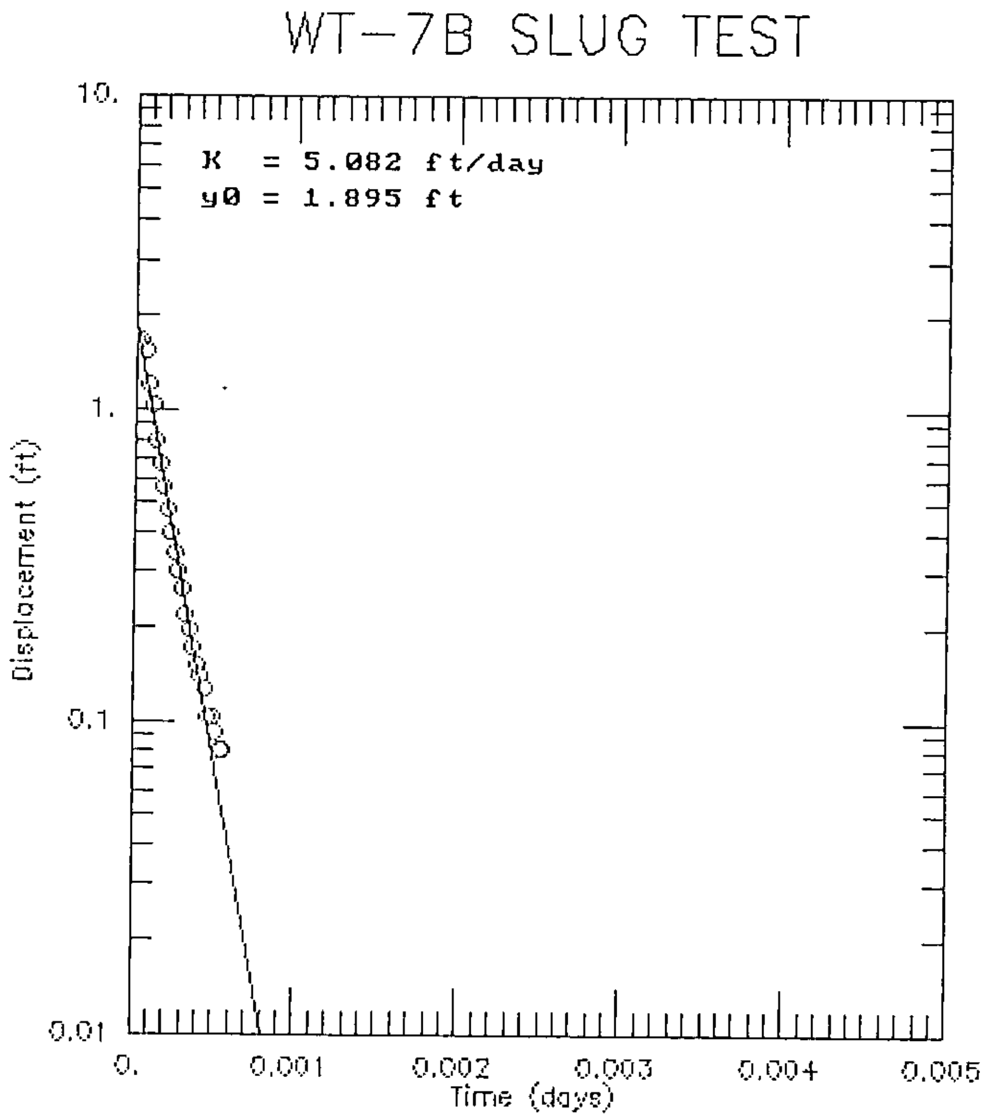
MW-5B SLUG TEST

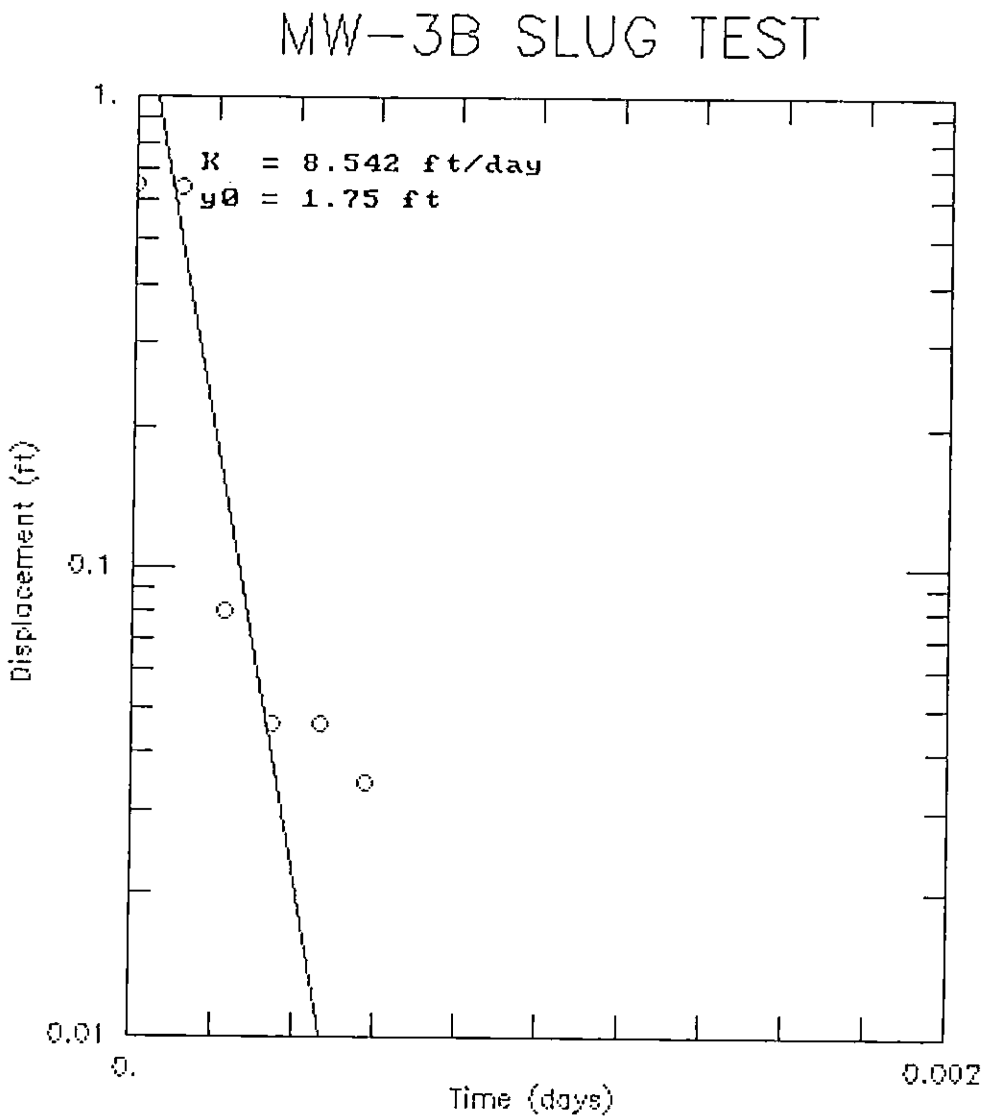



MW-21B SLUG TEST
K = 13.39 ft/day
y0 = 1.178 ft
1.
0.1
0.01
Displacement (ft)
0.
0.0004
0.0008
0.0012
0.0016
0.002
Time (days)

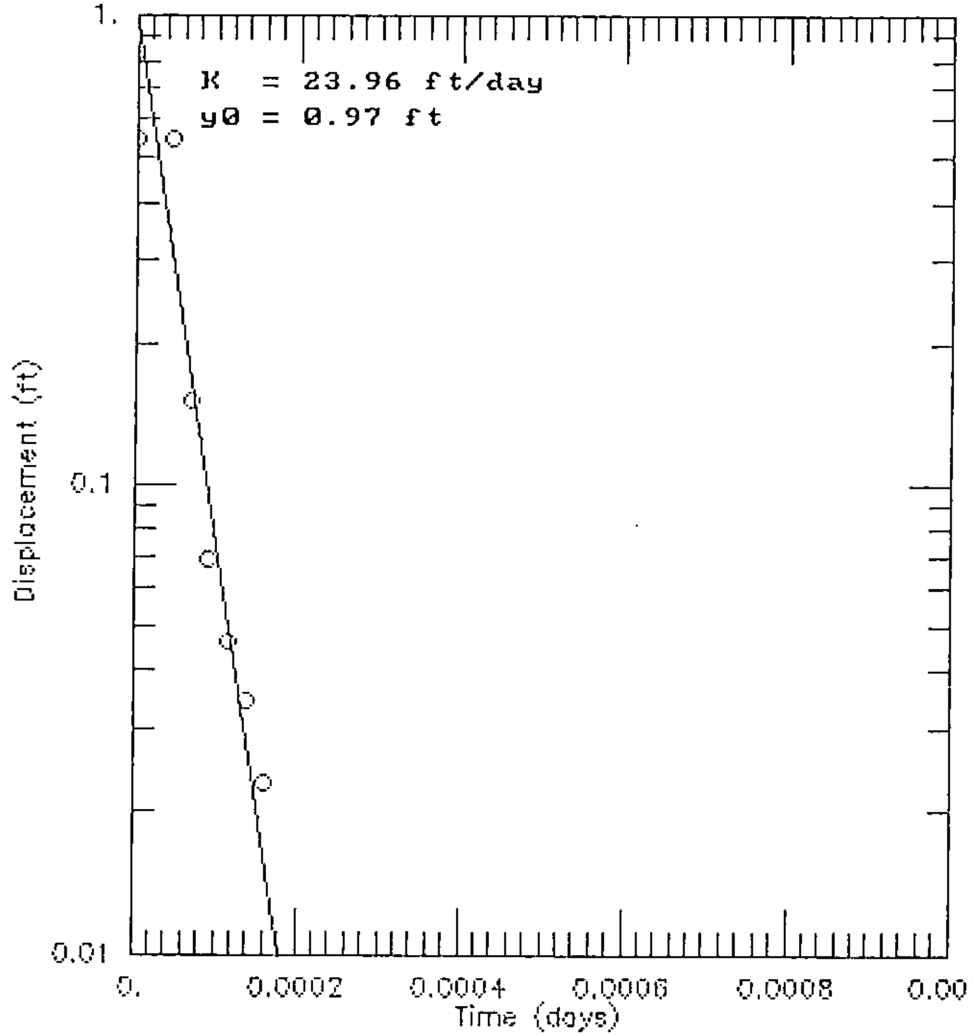


WT-5A SLUG TEST
K = 14.29 ft/day
y0 = 1.75 ft
10.
1.
0.1
Displacement (ft)
0.
0.001
0.002
0.003
0.004
0.005
Time (days)

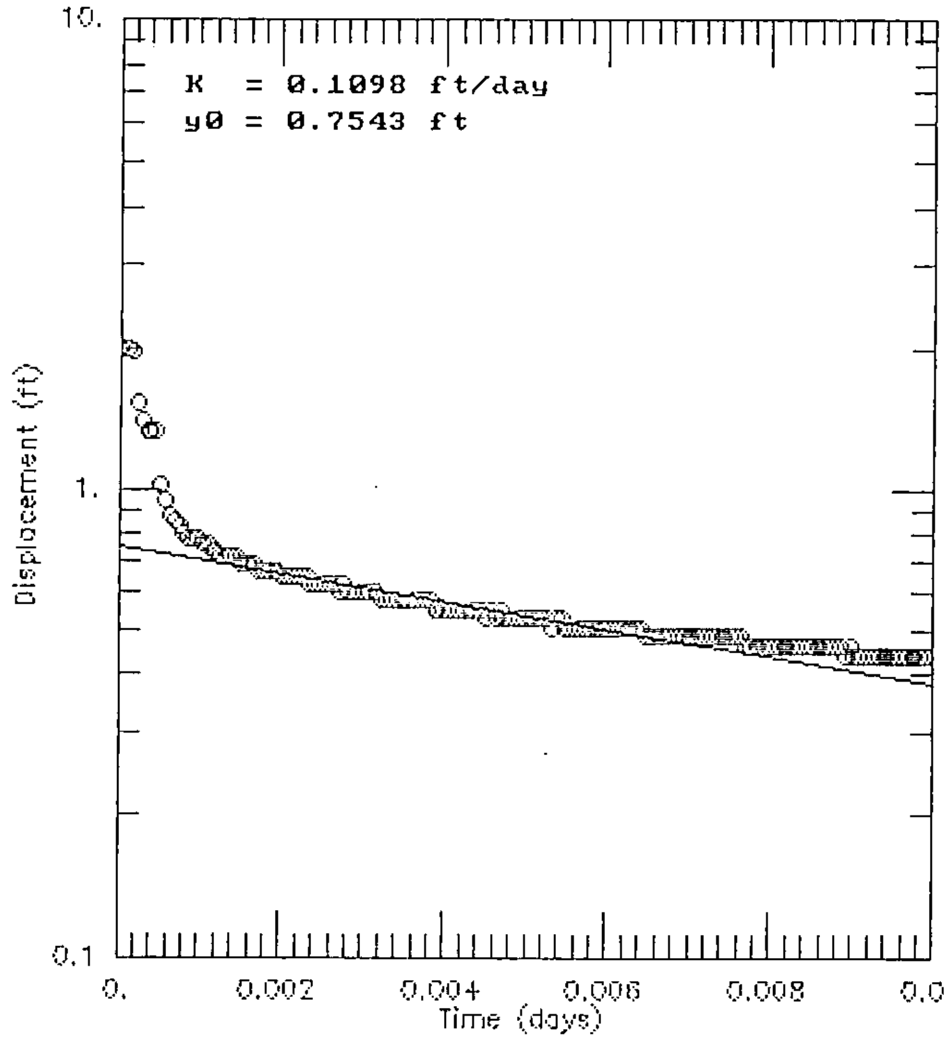

WT-7B SLUG TEST
K = 5.082 ft/day
y0 = 1.895 ft
10.
1.
0.1
0.01
Displacement (ft)
0.
0.001
0.002
0.003
0.004
0.005
Time (days)

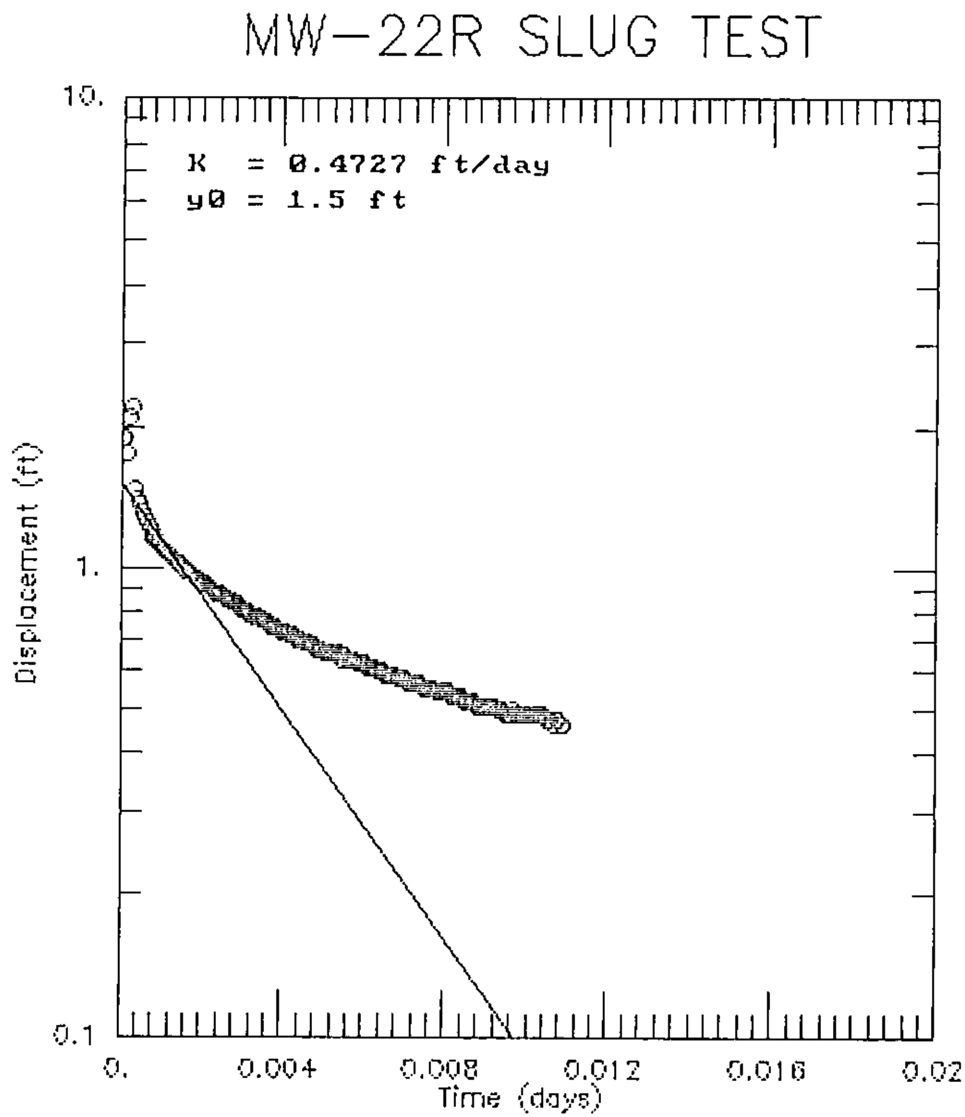

MW-3B SLUG TEST
K = 8.542 ft/day
y0 = 1.75 ft
1.
0.1
0.01
Displacement (ft)
0.
0.002
Time (days)

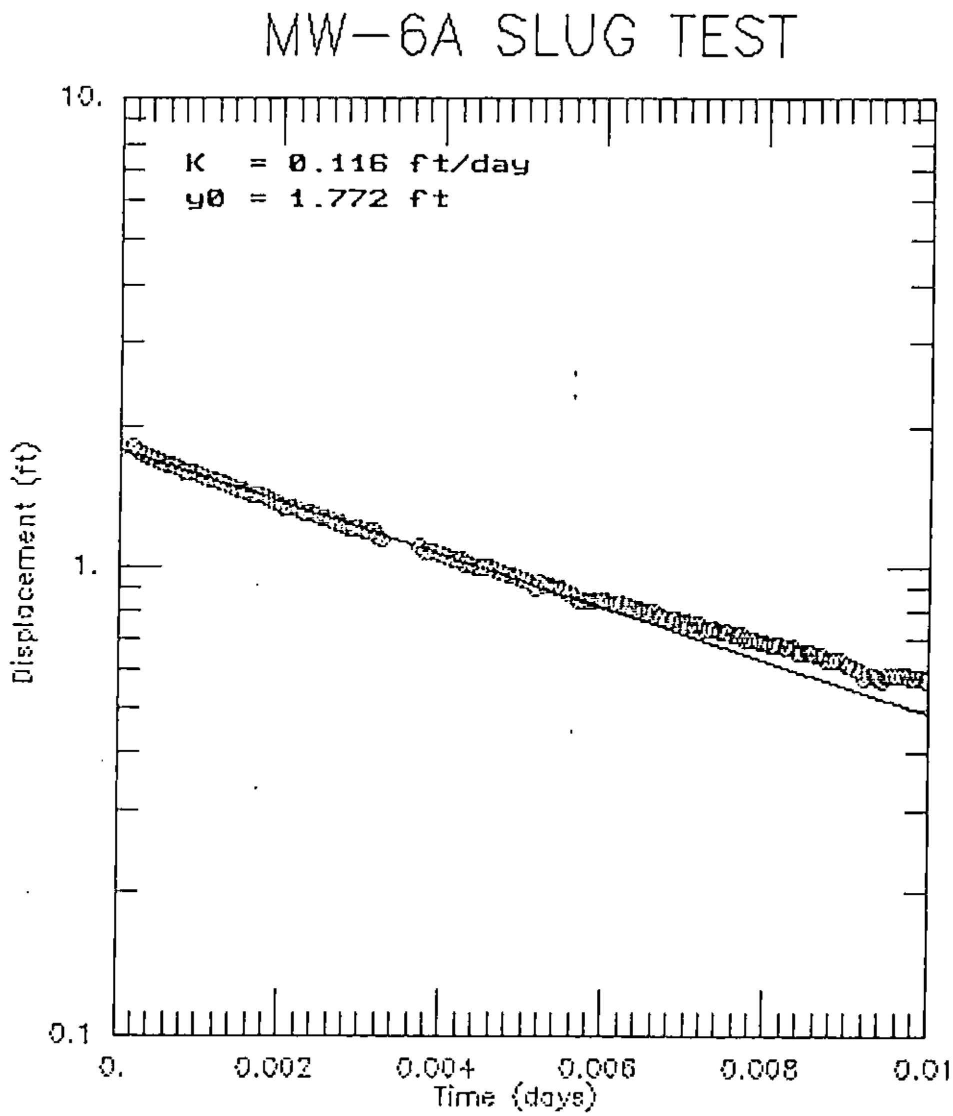
MW-10 SLUG TEST



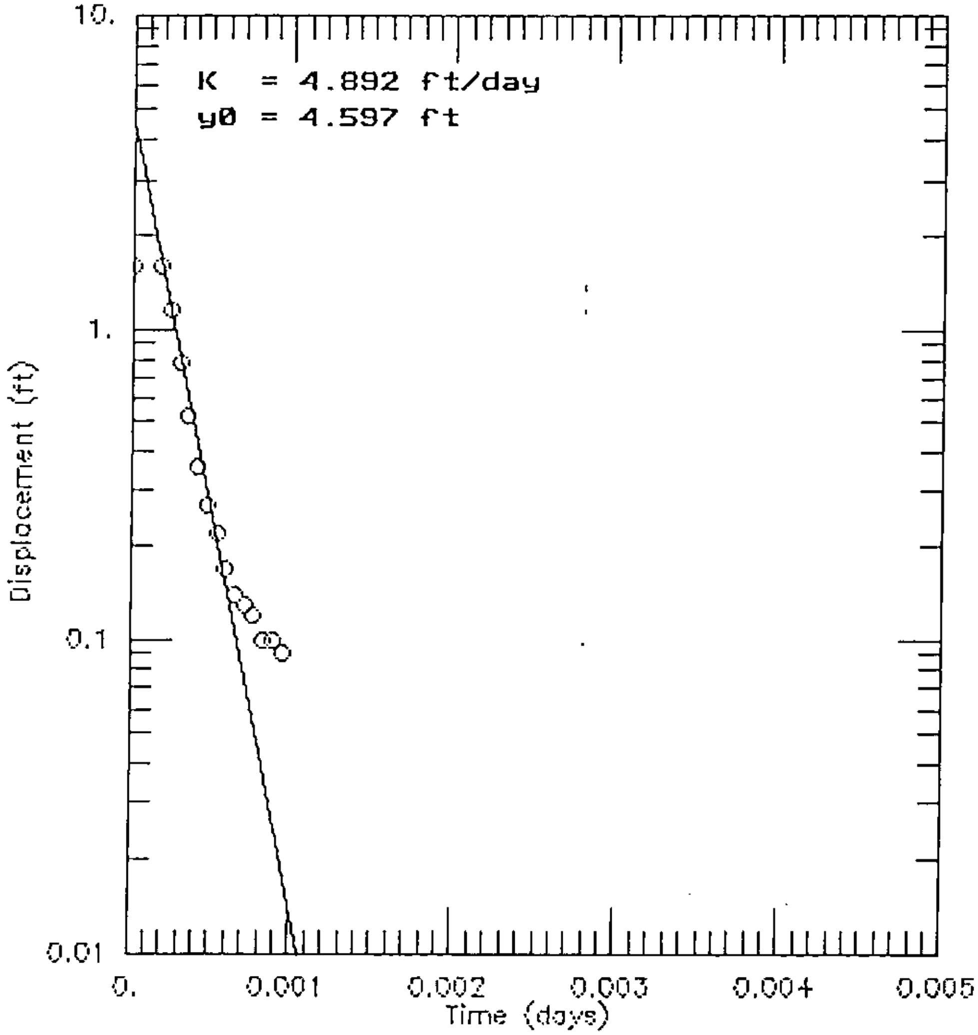
WT-13A SLUG TEST



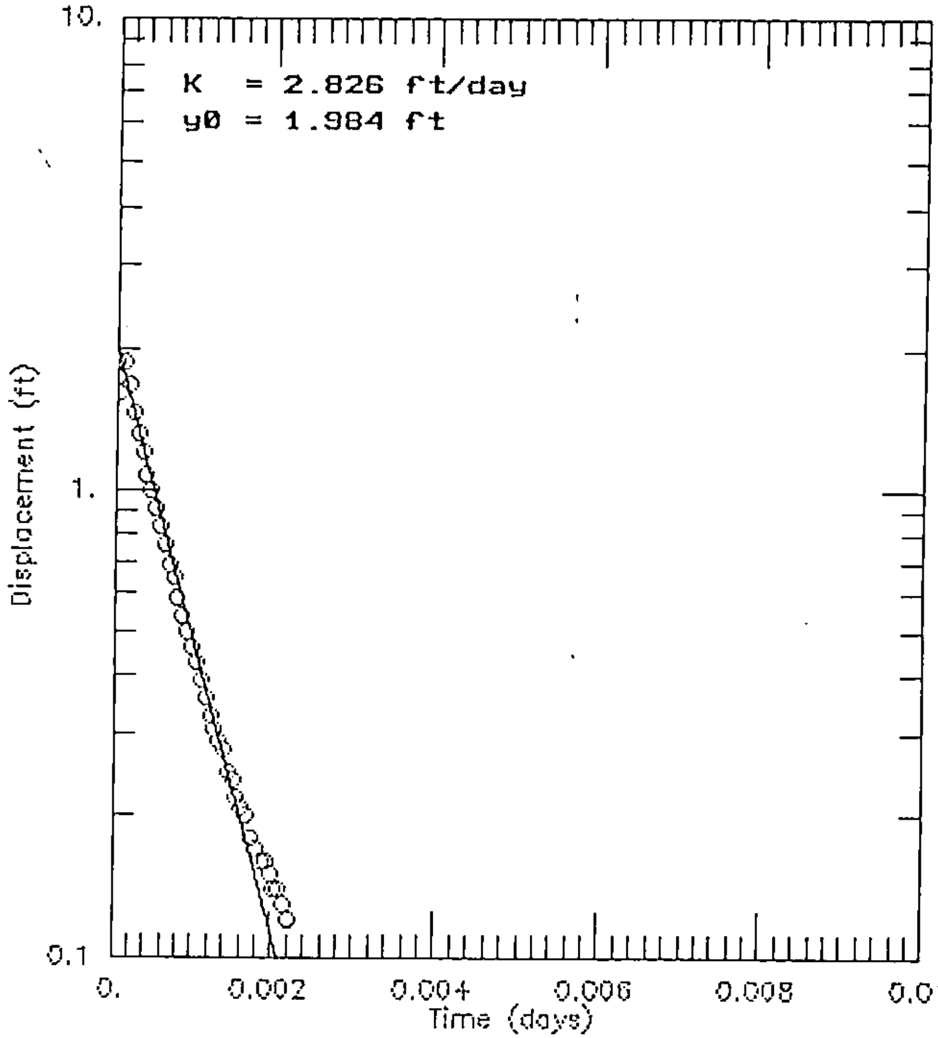

MW-22R SLUG TEST
K = 0.4727 ft/day
y0 = 1.5 ft
10.
1.
0.1
Displacement (ft)
0.
0.004
0.008
0.012
0.016
0.02
Time (days)


MW-6A SLUG TEST
K = 0.116 ft/day
y0 = 1.772 ft
Displacement (ft)
10.
1.
0.1
0.
0.002
0.004
0.006
0.008
0.01
Time (days)

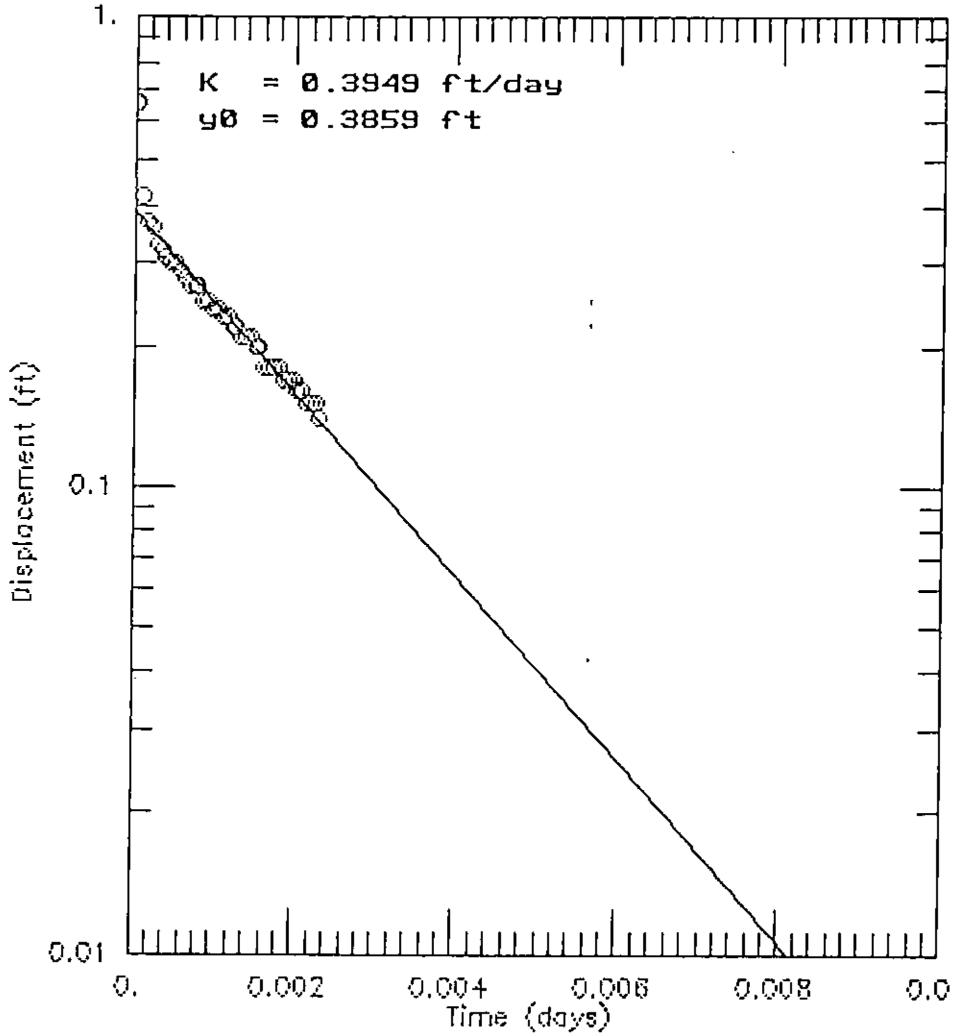
MW-6B SLUG TEST

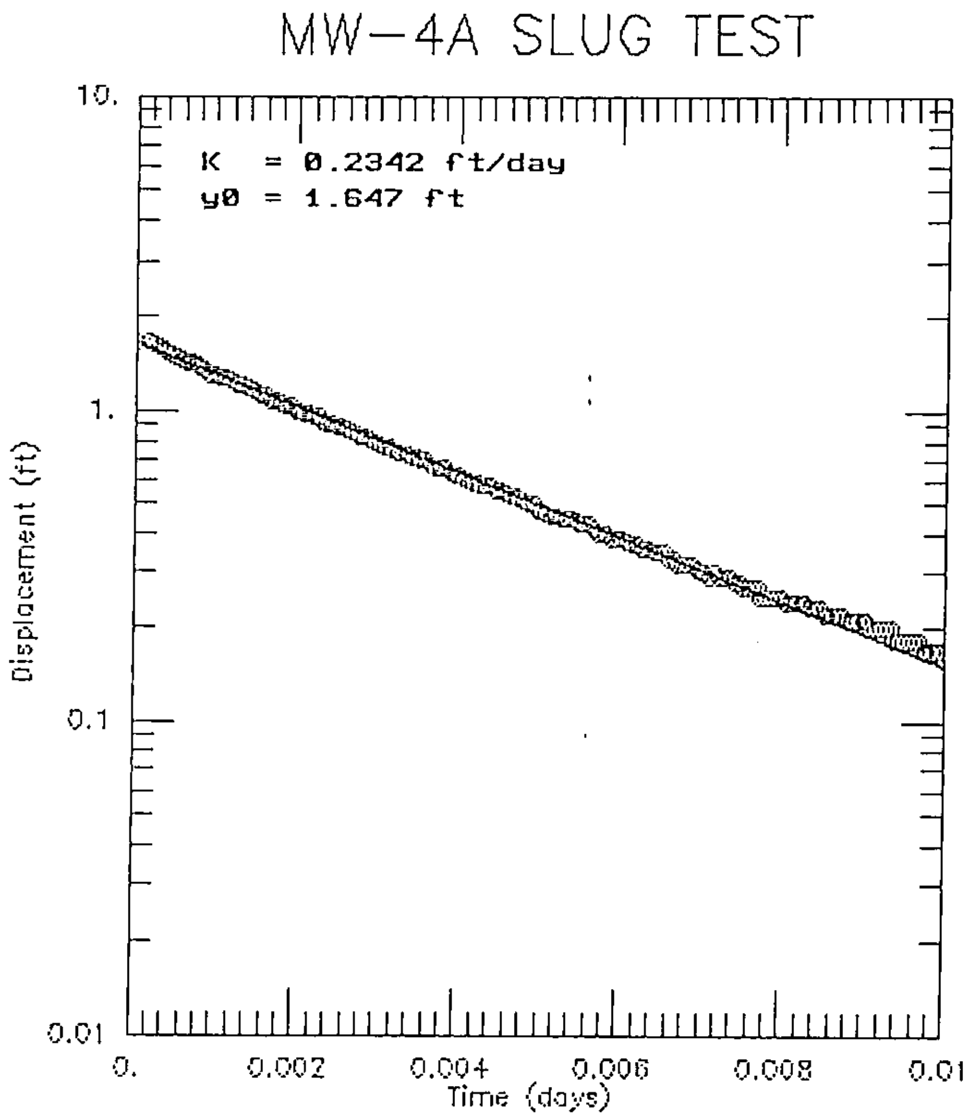


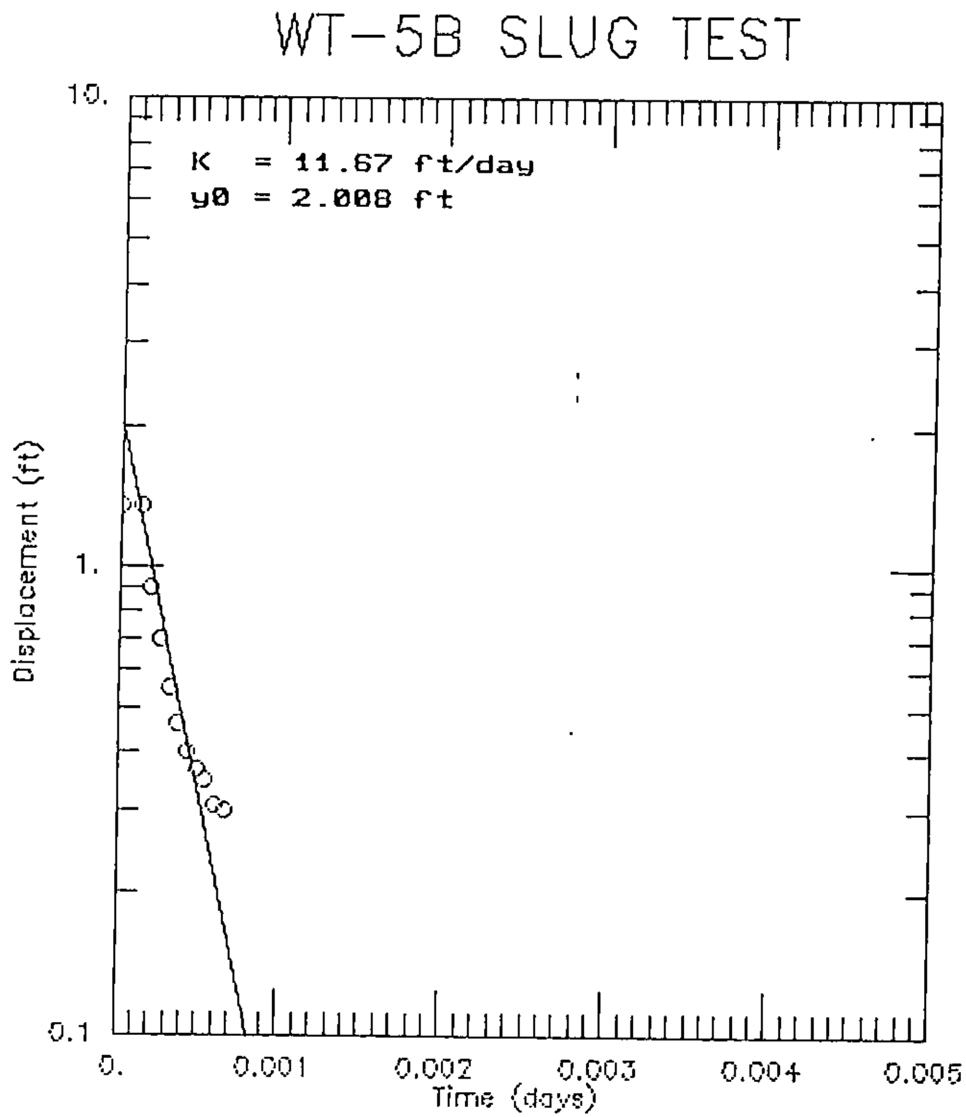
MW-4B SLUG TEST



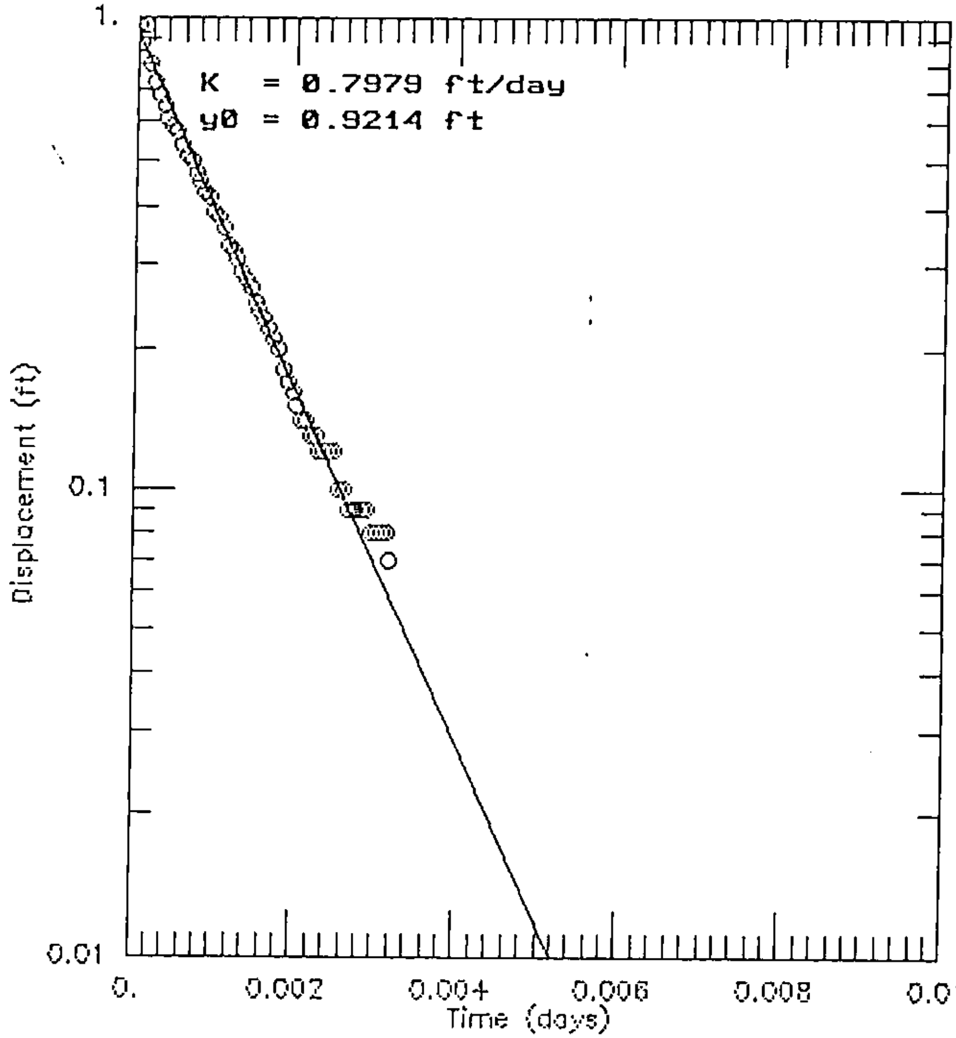
MW-3A SLUG TEST



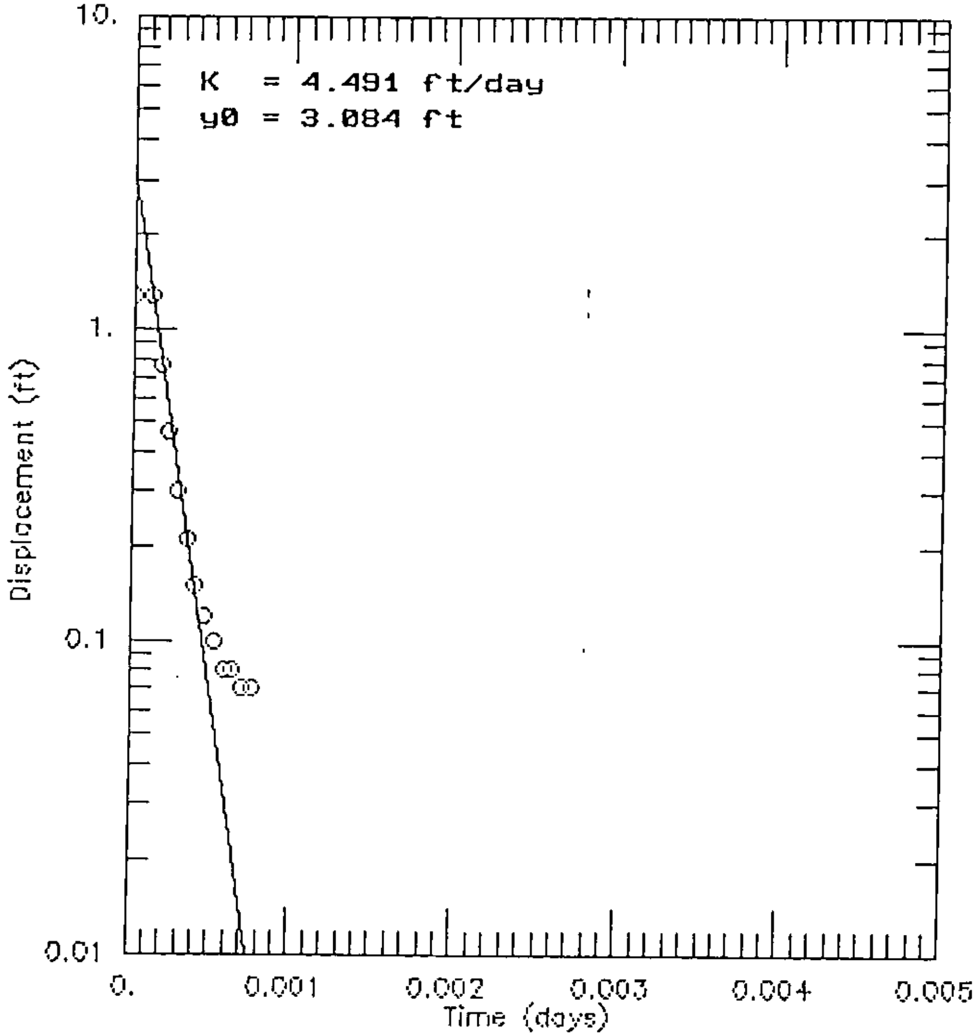

MW-4A SLUG TEST
K = 0.2342 ft/day
y0 = 1.647 ft
Displacement (ft)
10.
1.
0.1
0.01
0.
0.002
0.004
0.006
0.008
0.01
Time (days)

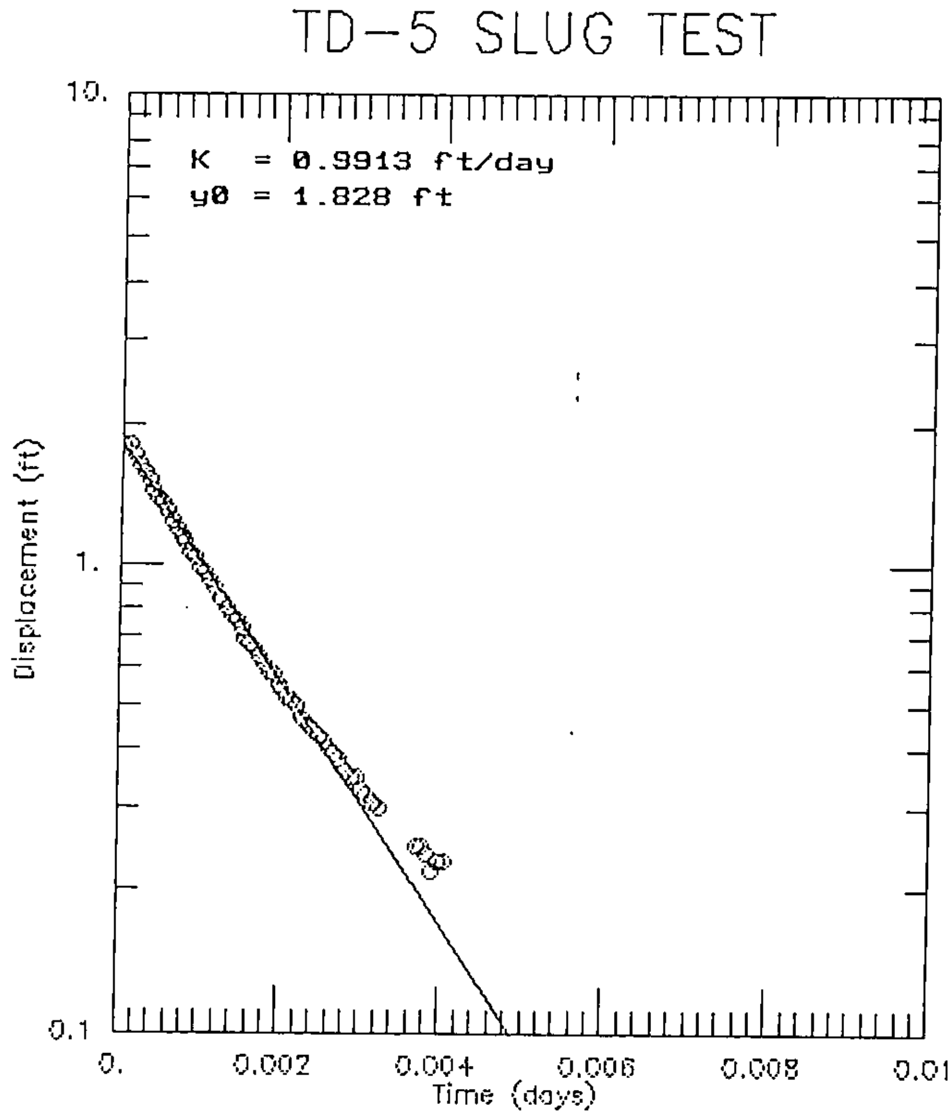

WT-5B SLUG TEST
K = 11.67 ft/day
y0 = 2.008 ft
Displacement (ft)
10.
1.
0.1
Time (days)
0.
0.001
0.002
0.003
0.004
0.005

MW-5A SLUG TEST



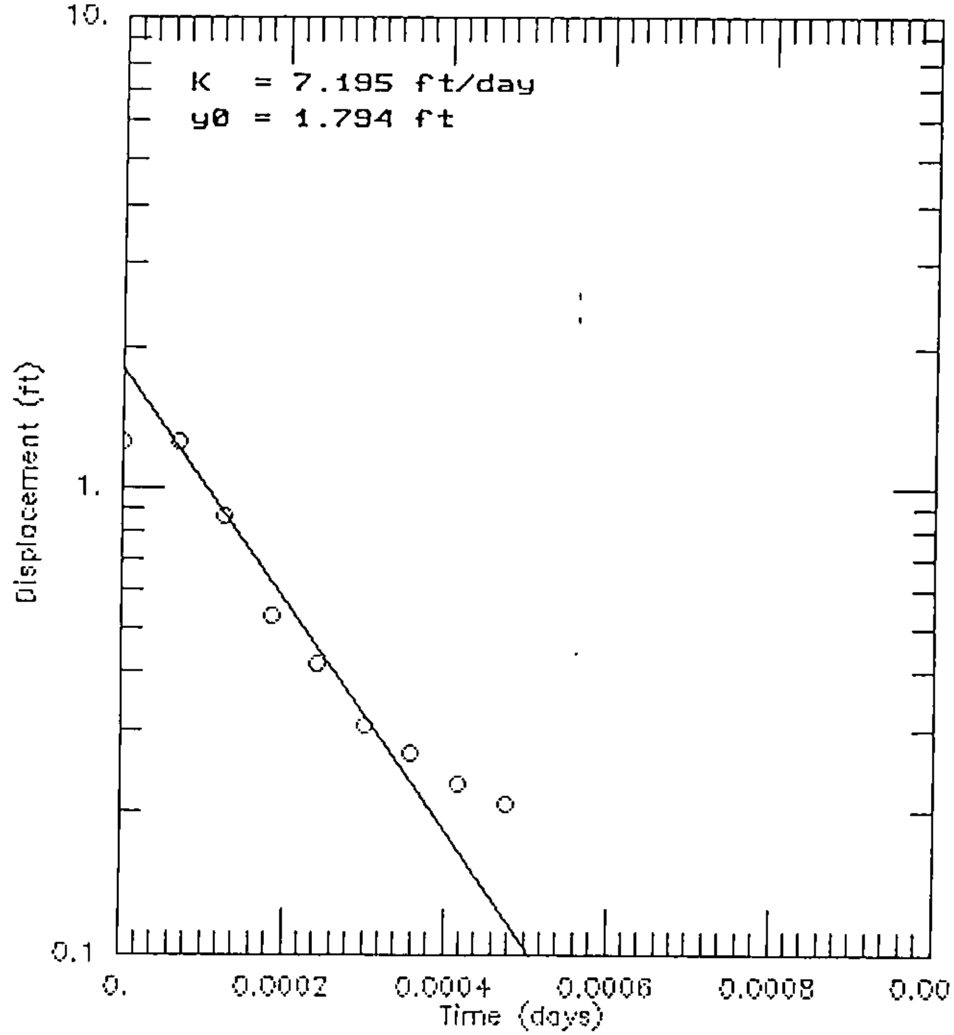
WT-7A SLUG TEST

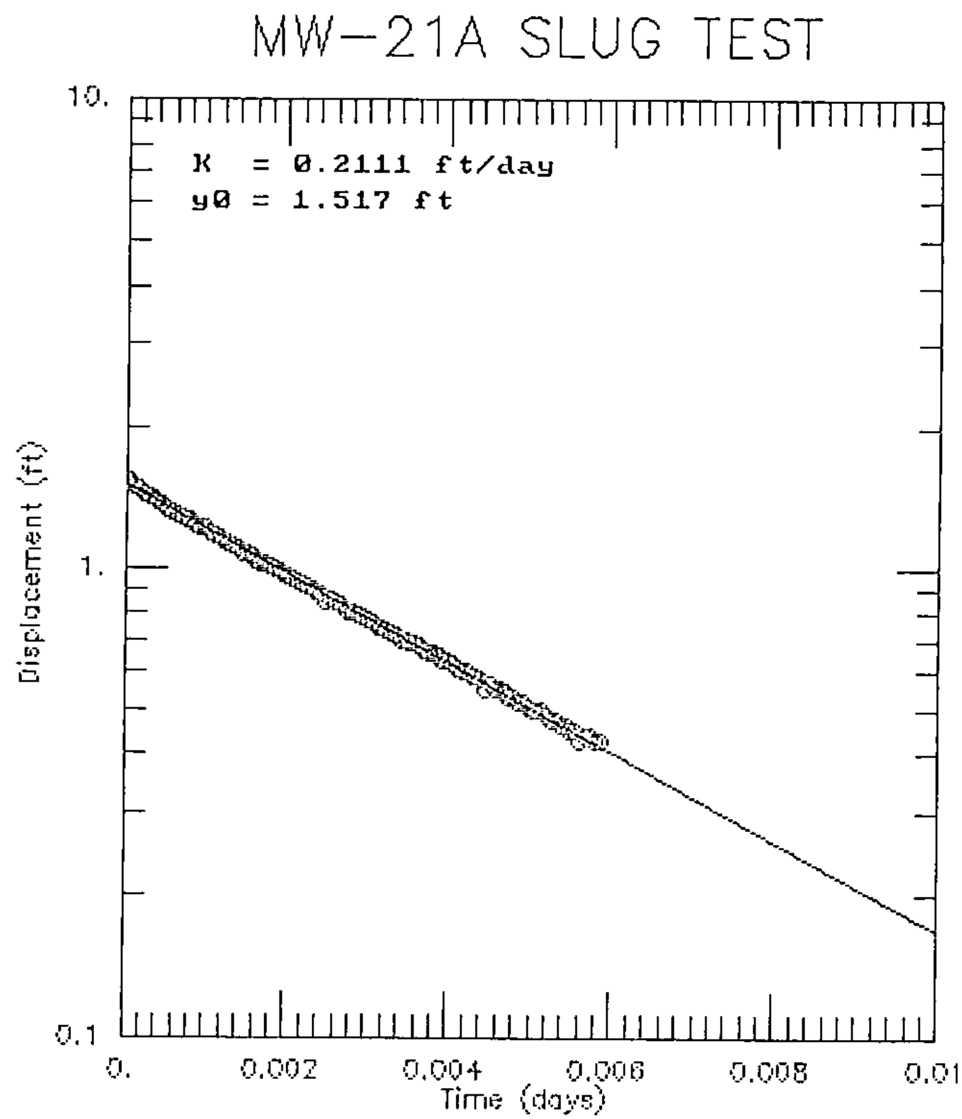




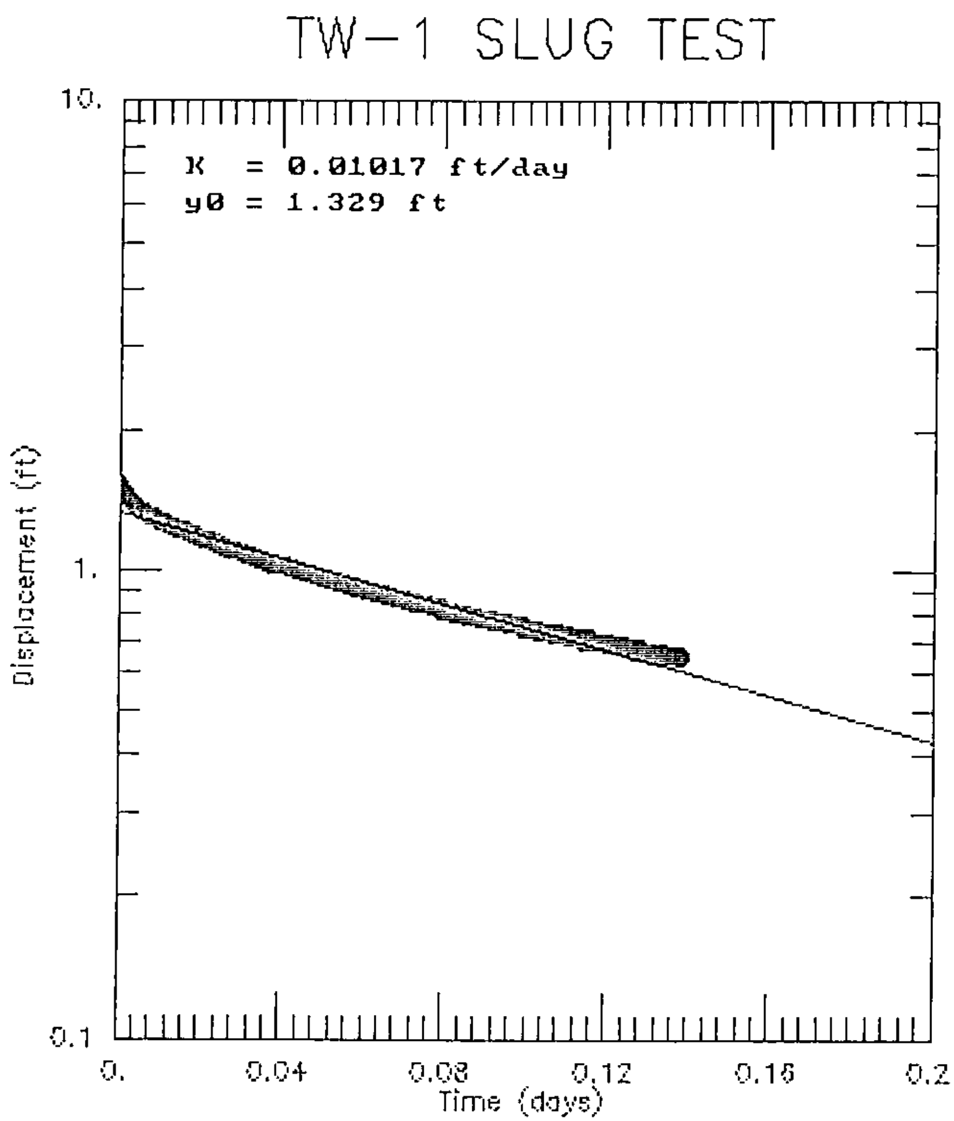
TD-5 SLUG TEST
K = 0.9913 ft/day
y0 = 1.828 ft
10.
1.
0.1
Displacement (ft)
0.
0.002
0.004
0.006
0.008
0.01
Time (days)

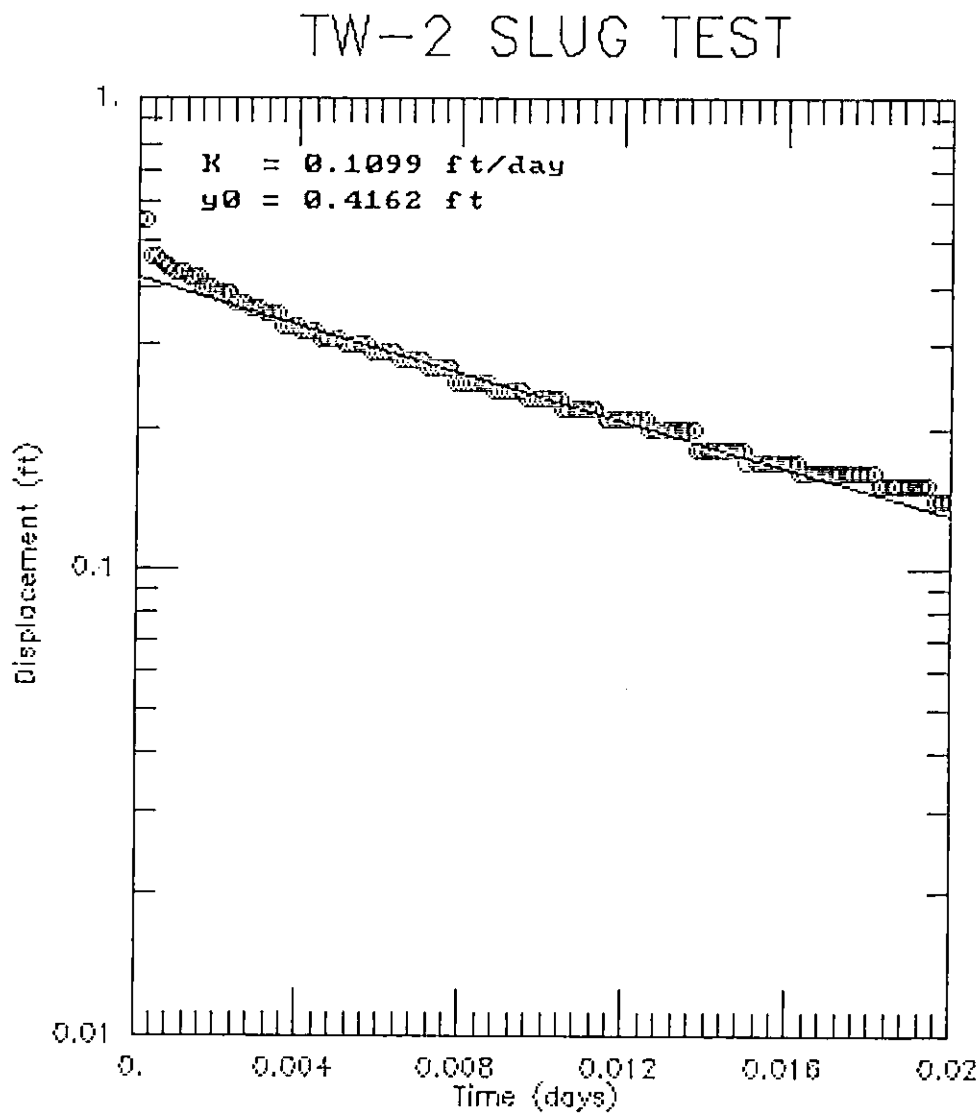
WT-3 SLUG TEST





MW-21A SLUG TEST
K = 0.2111 ft/day
y0 = 1.517 ft
10.
1.
0.1
Displacement (ft)
0.
0.002
0.004
0.006
0.008
0.01
Time (days)


TW-1 SLUG TEST
K = 0.01017 ft/day
y0 = 1.329 ft
Displacement (ft)
10.
1.
0.1
0.
0.04
0.08
0.12
0.16
0.2
Time (days)


TW-2 SLUG TEST
K = 0.1099 ft/day
y0 = 0.4162 ft
Displacement (ft)
1.
0.1
0.01
0.
0.004
0.008
0.012
0.016
0.02
Time (days)

APPENDIX D

RESULTS OF ANALYTICAL DATA QUALITY EVALUATION

APPENDIX D
Results of Analytical Data Quality Evaluation

The data evaluation was conducted using the appropriate procedures and guidelines for each analytical group, as described below. The data evaluation is being conducted for six soil, 62 ground water, four surface water, and four sediment samples, which were collected between August 24, 1994 and December 13, 1994 from the Monsanto Nitro facility. The ground-water samples were analyzed for VOCs, BN/AE compounds, inorganic metals, polychlorinated dibenzo dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), TOC and TOX. Soil and sediment samples were analyzed for VOC, BN/AE compounds and inorganic metals.

The listed parameters were provided in Appendix E of the RFI Work Plan. The samples were analyzed by Kemron Environmental Services located in Marietta, Ohio. Analytical data were reported in 15 sample delivery groups (SDGs). The SDGs include N4-08-517; N4-09-369, -397, -400, -444, -448, -468, -472, -513, -514, -515, -528, -530; N4-10-037; and N4-12-244.

For evaluation of organic chemical compounds including VOCs and BN/AE compounds, Roux Associates, Inc. used the USEPA's Region III Modifications to National Functional Guidelines for Organic Data Review - Multimedia, Multiconcentration, dated September 1994 (Region III Guidelines).

For evaluation of inorganic metal parameters, the USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Data Review, dated February 1994 was used. The USEPA's Region III Modifications to National Functional Guidelines for Inorganic Data Review, dated December 1990 was also used, where applicable.

For evaluation of PCDD and PCDF, the requirements listed in USEPA SW-846 Method 8280 were used. TOC and TOX results were evaluated using USEPA SW-846 Methods 9060 and 9020.

D.1 Holding Times

For VOCs, the technical holding time criterion for preserved water samples is 14 days from the date of sampling to the date of analysis. No Region III criterion exists for soils; therefore the USEPA's recommended 14 day water criterion was used for soils. All soil and ground-water samples analyzed for VOCs were analyzed within the prescribed holding time.

For BN/AE compounds, the technical holding time criterion for water samples is 7 days from the date of sampling to the date of extraction. No Region III criterion exists for soils; therefore the USEPA's recommended criterion of 7 days from date of sampling to extraction was used. For water and soil matrices, analysis of the extracted sample aliquot must be performed within 40 days of extraction. All ground-water and soil samples analyzed for BN/AE compounds were extracted and analyzed within the prescribed technical holding times.

For inorganic metals, the technical holding times for soil and preserved water matrices is 28 days from the date of sampling to the date of analysis for mercury and 180 days for all other metals. All soil and ground-water samples for inorganic metals were analyzed within the prescribed holding times.

The technical holding time for PCDD and PCDF for water matrices is 30 days from the date of sampling to the date of extraction, and 45 days from the date of sampling to the date of analysis. All PCDD and PCDF samples were analyzed within the specified holding times.

The technical holding times for TOC and TOX for water matrices is 28 days from the date of sampling to the date of analysis. Analysis of all samples for TOC and TOX were performed within the specified holding times.

D.2 Method, Trip, and Field Blank Results

The results of method, field, and trip blanks for organic and inorganic analyses were reviewed, and the appropriate data were qualified as discussed below. If a compound was detected in a blank sample, but not in the corresponding field samples, the data was not qualified. If the compound was detected in the field samples Roux Associates, Inc. applied the "5x Rule", which states that if the sample concentration is less than 5 times the concentration detected in the corresponding blank, then field samples are qualified with "B".

Field and trip blanks were collected at a frequency of one field and trip blank per 20 field samples. Field blanks collected during RFI activities consisted of equipment blanks, which were collected by pouring deionized water over pre-cleaned sampling equipment.

The VOC, 2-butanone (MEK), was detected in the field blank associated with the soil and sediment samples, collected on August 24-25, 1994. Since MEK was not detected in the corresponding field samples, the data was not qualified. No other VOCs were detected in the field, method or trip blanks.

One inorganic metal, zinc, was detected in method blanks associated with samples included in SDGs N4-09-369, N4-09-397, N4-09-448, and N4-09-444, at a concentration of 0.01 milligrams per liter (mg/ℓ) in each method blank. Using the "5x rule", the results detected at less than 0.05 mg/ℓ were qualified. In accordance with the Region III Inorganic Criteria, zinc results were qualified for samples MW-5B, MW-6A, MW-17B, and WT-7C.

There were no other inorganic metals detected in the field or method blanks. Also, there were no BN/AE compounds, PCDD, PCDF, TOC, or TOX detected in field or method blanks.

D.3 Field Duplicate Analysis

Field duplicate samples were collected for soil and water matrices. The duplicate samples were collected at the same time as the field sample using the same sampling equipment. Three duplicate samples were collected for ground-water sample analyses (MW-19A Dup, WT-10A Dup, and TD-5 Dup), and two duplicate samples were collected for soil sample analyses (10M and SED-4). The purpose of collecting field duplicate samples was to evaluate the overall precision (i.e. reproducibility) of the sampling and analyses. Sample and duplicate results and the calculated relative percent differences (RPDs) are provided on Table 2.

The RPD was calculated using the following equation:

$$RPD = \frac{|SR-DR|}{0.5\ (SR+DR)}\ X\ 100,$$

where SR is the sample result and DR is the duplicate result. The RPD is expressed as a percent.

The RPD was not calculated if either sample or duplicate sample results were not detected, or if either value was less than 5 times the detection limit.

No criteria are available for qualifying field duplicate results. However, based on the Region III criteria for laboratory replicates, RPDs of 20% for ground water and 35% for soils were used for comparison purposes. As shown in Table 2, RPD values for the ground-water samples were less than 20 percent in all but two instances, and RPD values for the soil samples were less than 35 percent in all but one instance. These results are considered acceptable, particularly considering the variability common in field duplicates. No effect on data quality was observed through the review of field duplicate results.

The field duplicate results review indicated that some compounds were detected in the original sample, but not in the corresponding duplicate, or vice-versa. For soil and sediment matrices, the duplicate sample SED-4 showed nickel and selenium in the duplicate, but not present in the original sample. For ground-water samples, duplicate samples for WT-10A and MW-19A showed chromium and copper in the sample, but not in the duplicate. In each case, concentrations were near the detection limit, and the results do not impact data quality.

D.4 Surrogate Recovery Rates (System Monitoring Compounds)

Surrogate recovery rates for VOCs and the BN/AE compounds were evaluated. If surrogate recovery rates were within USEPA's specified criteria, the data were not qualified. Qualification of samples was performed in accordance with the Region III Guidelines as described below.

For VOCs, three monitoring compounds are added to all samples and blanks to measure their recovery in sample and blank matrices. If the recovery of any VOC is outside the USEPA criteria, but greater than 10 percent recovery, the sample results are considered estimates. Affected sample and blanks results are qualified with a "J" for detected results and "UJ" for non-detected results.

Region III has also established criteria to evaluate the data if any VOC surrogate shows less than 10 percent recovery or if two or more of the standards are outside the criteria, as indicated below:

Qualification of Volatile Analytes Based on
System Monitoring Compound Recoveries

	1 or more <10%	1 High/Low	2 or 3 High/Low	2 or 3 All Low	2 or 3 All High
Detected Analytes	L	J	J	L	K
Non-Detected Analytes	R	UJ	UJ	UL	None

For VOCs, sample RB-1 showed one surrogate recovery above advisory limits. Therefore, VOC results for sample RB-1 were qualified as estimated "J" and non-detected compounds were qualified "UJ" as estimated. MW-7 showed two surrogate recovery results above USEPA-specified criteria. The results for the three compounds are qualified as "K" for high bias. Also in sample MW-21A, one surrogate recovery was high. There were other no VOCs detected in the sample; therefore, the non-detected results are considered estimates, and qualified as "UJ". There were no other VOC results qualified due to surrogate spike recovery problems.

For BN/AE compounds, three acid fraction compounds and three base/neutral fraction compounds are added to all samples and blanks to measure their recovery in sample and blank matrices. If the surrogate standard recovery for two or more analyses, per fraction, are outside of the USEPA's specified criteria, then the associated fraction is qualified as indicated below:

Qualification of Semivolatile Analytes Based on
Surrogate Recoveries

SURROGATE RECOVERY

	2 or 3 All High	2 or 3 All Low	2 or 3 Mixed High/Low	1 or More < 10% Rec.
Detected Analytes	K	L	J	L
Non-Detected Analytes	None	UL	UJ	R

For BN/AE compounds, a number of samples showed surrogate recoveries outside advisory limits. For the base-neutral fraction, sample MW-7 showed two surrogate recoveries below advisory limits. Therefore, all detected base neutral compounds will be qualified as estimated "L". All non-detected compounds will be qualified "UL" as estimated.

For acid-extractable compounds, 20 samples showed at least two surrogate recoveries below advisory limits and at least one surrogate recovery below 10 percent. Samples MW-23A, MW-3A, MW-19A, MW-4A, MW-20A, MW-5A, MW-18A, WT-7A, WT-7B, WT-4A, WT-4B, WT-3, WT-9A, WT-5B, WT-5A, TD-3, WT-13A, TB-1, TB-3, and TD-5 all showed poor acid-extractable surrogate recoveries. Therefore, all detected acid-extractable compounds were qualified "L" low, and non-detected compounds were qualified "R" as unreliable.

D.5 Method Detection Limits

Method detection limits (MDLs) for the analyses were specified in Appendix E of the approved RFI Work Plan, as part of the Laboratory Quality Assurance Project Plan (QAPP). The instrument detection limits for each of the samples was compared to the QAPP-specified MDLs.

The laboratory achieved the approved MDLs in all cases except the following. In VOC samples from MW-20A, MW-20B, MW-5A, MW-2A, and WT-14A the instrument detection levels were higher than the QAPP-specified MDLs. The elevated instrument detection level was caused by a 5-times volume sample dilution, due to elevated VOC concentrations in the samples. In VOC sample MW-7, the instrument detection level also exceeded the QAPP-specified MDLs, as a result of a 50-times volume dilution, due to elevated VOC levels.

In BN/AE results from MW-24A, the instrument detection levels were higher than the QAPP-specified MDLs. The elevated instrument detection level was caused by a 20-times volume dilution, due to elevated BN/AE compound concentrations in the sample.

Data useability may be affected in isolated sample dilution instances where VOC compounds were not detected, but have Permit-specified levels below the elevated detection limits. These include MW-20A, MW-20B, MW-5A, MW-2A, WT-14A, and MW-7. However, these samples contain high concentrations of other constituents above Permit-specified levels.

D.6 Split Sampling

The West Virginia Department of Natural Resources (WVDNR) collected five split samples from monitoring wells MW-1A, MW-23A, MW-6A, TD-3 and WT-13A on September 19, 21, and 23, 1994. The purpose of split sample collection was to evaluate the interlaboratory precision (i.e. reproducibility) of the analyses. Split sampling was performed by alternately filling sample containers with ground water, using the same bailer. Sample containers and preservatives used by the WVDNR were provided by WVDNR, while Monsanto's containers and preservatives were provided by the laboratory, Kemron.

Monsanto analyzed the samples using USEPA Method SW-846 8240, and WVDNR analyzed the split samples for VOCs using USEPA Method SW-846 8260. Table 3 presents a comparison of detected VOC analytes provided by the WVDNR; Appendix E provides the WVDNR analytical data. Despite using the different procedures, the analytical results from the split samples were similar, as described below.

As shown in Table 3, sample results compared favorably between the WVDNR and Monsanto analyses, with one exception for the sample from monitoring well MW-1A. Chloroform was detected by Monsanto at over twice the concentration as reported by WVDNR. However, chloroform was detected at low concentration (10 micrograms per liter). Given the fact that samples were split and run by different laboratories and analyzed using different procedures, the results are considered to show a reasonable level of reproducibility.

APPENDIX E

WVDNR Compliance Monitoring Report

Mark Lucki
Royce /SS.

DEPARTMENT OF COMMERCE, LABOR & ENVIRONMENTAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
1356 Hansford Street
Charleston, WV 25301-1401

Gaston Caperton
Governor

John M. Ranson
Cabinet Secretary

David C. Callaghan
Director

Ann A. Spaner
Deputy Director

October 11, 1994

Ms. Rhonda Hooper
Monsanto Chemical Company
No. 1 Monsanto Road
Nitro, West Virginia 25143

Dear Ms. Hooper:

Enclosed is a copy of the **Compliance Monitoring Evaluation (CME)** report completed on your facility by a representative of the Chief of the Waste Management Section. This report is based on the inspection conducted on September 23, 1994.

The United States Environmental Protection Agency has been notified so that this report can become a permanent to the addition to the compliance history of this facility.

Thank you for your assistance and cooperation during this inspection. If you have any questions concerning the inspection or attached report, please feel free to contact Inspector David Cunningham at 558-5989.

Sincerely,

Thomas A. Fisher

Thomas A. Fisher
Inspector Supervisor - Southern Unit
Compliance Monitoring/Enforcement
Office of Waste Management

kw

Enclosure

cc: Dave Cunningham, Inspector
Jean Sofield, U.S. EPA Region III
File

INSPECTION FACT SHEET

COMPANY NAME: Monsanto Chemical Company **I.D.#:** WVD039990965

MAILING ADDRESS: No. 1 Monsanto Road
Nitro, WV 25143

TYPE OF FACILITY:
Permitted TSD/Generator

LOCATION: Same

COUNTY: Putnam (079)

COMPANY CONTACT: Rhonda Hooper

HANDLING CODES:

TELEPHONE: 304-759-4400 or 4368

PURPOSE: To conduct a RCRA Compliance Monitoring Evaluation Inspection.

APPLICABLE REGULATIONS:
West Virginia Hazardous Waste Management Act, Chapter 22-18 and 40 CFR, Parts 260-280.

LIST OF CHEMICALS:
(For Small Quantity Generators, list amount of waste, how it is handled, where it goes).

DATE INSPECTED: September 19, 21, 23, 1994 ___ VIOLATIONS

INSPECTORS: (1) Dave Cunningham ___ NO VIOLATIONS

(2) Henry Haas

DATE PREPARED: September 26, 1994

PREPARED BY: Dave Cunningham

COMPLIANCE MONITORING EVALUATION

RE: Monsanto Chemical Company
No. 1 Monsanto Road
Nitro, West Virginia 25143
EPA Identification Number: WVD039990965

DATE INSPECTED: September 19, 21, and 23, 1994

INSPECTED BY: Dave Cunningham, WV DEP/OWM
Henry Haas, WV DEP/OWM

REPORT BY: Dave Cunningham

On September 19, 1994 at approximately 1045 hours the above referenced West Virginia Division of Environmental Protection Office of Waste Management personnel arrived at the Monsanto Nitro facility to conduct a Compliance Monitoring Evaluation. This inspection was to be made in conjuncture with the work being done by ROUX Associates Inc. of West Deptford, New Jersey on Monsanto's RCRA Facility Investigation (RFI). Upon arriving at the facility, we signed in at the front desk and were met by Ms. Rhonda Hooper of Monsanto. Ms. Hooper instructed us to report to the front gate guard house and watch the plant safety video prior to entering the plant. We proceeded to do this and when finished signed in at the front gate.

Ms. Hooper met us at the front gate and we followed her to the Southeast corner of the facility property to witness the purging and sampling of monitoring well No. MW-1A and 1B. The company was having approximately 65 wells sampled during this RFI. We planned to split six of these samples with the company. The first split was to be MW-1A. Mr. Scott Anderson was in charge of the ROUX Associates Inc. crew doing the work on the wells for Monsanto. This crew began the set up on MW-1A and 1B when we arrived. The "A" and "B" numbering on the wells corresponds to the groundwater aquifers at the site. All "A" wells are supposed to be screened and developed to the upper zone of the aquifer and the "B" wells are supposed to be screened and developed to the lower zone of the same aquifer. ROUX Associates Inc. appeared to do a good job of checking the purge water pumping rate and volume and preparing each well for sampling.

We witnessed the preparation work on both MW-1A and 1B and obtained split samples of MW-1A at approximately 1300 to 1320 hours. The analysis to be performed on both of these wells consisted of VOC, BN/AE, Metals, TOC and TOX. At about 1330 we finished with this well and departed the facility for lunch.

At approximately 1410 we returned to the facility, signed in at the front gate and proceeded to the Southwest corner of the property (on the Kanawha River bank) to witness sampling and split samples from well No. MW-23A. Upon arriving at this well, the ROUX crew had just finished the purging of the well and was waiting for it to recharge for the sampling. At about 1430 we split samples of the MW-23A well. (The analysis results for the VOA show obvious problems with this well. See analysis). This concluded our sampling for this date, so we thanked Mr. Anderson and departed the facility at about 1500 hours.

On September 21, 1994 at approximately 0900 we again arrived at the Monsanto Nitro facility and signed in at the front gate and met with Ms. Rhonda Hooper. We followed Ms. Hooper to where the ROUX team was working on well No. MW-17A and 17B along the southern edge of the facility property. We witnessed the purging and sampling of these wells. When the team finished these wells, we followed them to well No. MW-6A and 6B at approximately 1018. This well is located along the Kanawha River bank on the Northeast corner of the Monsanto production property. The ROUX team set up their sampling equipment and began purging the proper volume of water from the MW-6A well. After purging and monitoring the well, we had to wait for about 10 to 15 minutes for the well to recharge enough for sampling. (Like most of the "A" wells along the river bank, this one had a very slow recharge rate). At 1100 hours we began splitting samples at this well. Once again this well was to be sampled for VOA, BN/AE, Metals, TOC and TOX. It should be noted that the liquid from this well was very black in color and had a great deal of solids in it as well as a very strong chemical odor similar to the ambient air at the Monsanto facility. After obtaining these samples from MW-6A, we witnessed the purging of MW-6B. The liquid from this well appeared clear and normal in color. This concluded our sampling for this date and departed the facility at approximately 1140 hours.

On September 23, 1994 at approximately 0945 hours Henry Haas and I returned to the Monsanto, Nitro facility to split samples at the wells near the Monsanto waste treatment unit and decontaminated 2, 4, 5T building. Upon arriving at the site, we signed in at the front office and gate and proceeded to the waste treatment area where the ROUX team was already set up and preparing well No. WT-5A and 5B. After the team purged the 6-A well, we split samples with them. The parameters to be analyzed on this well are the same as the previous three we had split with the ROUX team.

At about 1025 we moved to well No. TD-3 on the Kanawha River bank behind the decontaminated 2,4,5T building. The ROUX team again set up on this well and began to purge the proper well water volume from it. The water level was so low in this well and the recharge rate so slow that the team had to hand bail this well instead of pumping it as they had on all the previous wells. After purging 3 gallons of water from this well, we again split samples with them. The liquid in this well was brackish and had a chemical odor. The parameters to be analyzed on this well were the same as the others with the addition of Dioxins and Dibenzofurans. We finished sampling of this well at about 1100 hours.

We then proceeded to well No. WT-13A to take our last split sample. The ROUX team set up on the well and began their measurements and purging. After they had completed all of this, we split samples of this well at approximately 1150. This well also was to be analyzed for VOA, BN/AE, Metals, TOC, TOX, Dioxins, and Dibenzofurans.

This concluded our sampling for the RFI and CME for this facility. We thanked Mr. Anderson for his help and departed the facility at about 1208 hours.

SAMPLE ANALYSIS RESULTS

Find attached the results of sample analysis for well Numbers MW-6A, TD-3, WT-5A, WT-13, MW-1A and MW-23A. These samples were split with company and proper chain of custody followed until they were delivered to the Guthrie laboratory for analysis of VOA.

COMPLIANCE EVALUATION

The compliance evaluation for this facility is pending at this time until further completion of the Corrective Action process. There were no problems noted during our visits regarding the facility's sample methods or sample handling procedures.

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407602

Branch Submitting Sample: Waste Management

Program for which samples are to be analyzed: RCRA (INFO ONLY).

Field Sample Identification Number: Monsanto MW-1A

Date Sample was taken: 9/19/94

Sample Matrix: Water

Date Sample was received: 9/20/94.

Date Sample was extracted: 9/21/94

Date Sample was Analyzed: 9/21/94.

Ph of Sample adjusted to: N/A

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): —

Weight of Sample Purged (g): —

In Milliliters of Water: —

Percent Moisture (Not Decanted): —

Analyzed By GC/P&T/FID: HEC: MS: — PID:

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method:

Laboratory Comments:

Date Sample was Completed: 9/21/94.

Analyst: J. Campbell

All Data Reviewed and Accepted On: Date

By Quality Assurance Officer:

Q.A./Q.C. Comments:

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... of Environmental Protection

WV DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
GUTHRIE CENTER LABORATORY
4900 Brenda Lane - Building #14
Charleston, WV 25312
(304) 558-4057

LAB SAMPLE #
GCL-9407602

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgable Halocarbons 1 x TCL
Purgable Aromatics 1 x TCL
BNA Extractables N/A x TCL
Pesticides/PCBs N/A x TCL

COMPOUND NAME	ug/Kg ug/L
Chloroform	4.6
No other 8260 Volatiles Detected	See Form 1.11

Laboratory Comments:

Data Release Authorized by J. Campbell 9/21/94
Lab Supervisor Date

Sample Analyses Reported to: D. Cunningham

LAB SAMPLE #
GCL-9407602

Organics Analysis Data Sheet

Tentatively Identified Compounds

CAS Number	Compound Name	Method	RT (min)	Estimated Concentration (ug/l or ug/kg)
1. 112-41-4	1-Dodecene	8260	21.35	43
2. 629-50-5	Tridecane	8260	21.43	11
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

AOC

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407603

Branch Submitting Sample: Waste Management

Program for which samples are to be analyzed: RCRA (INFO ONLY)

Field Sample Identification Number: Monsanto MW-23 A

Date Sample was taken: 9/19/94

Sample Matrix: Water.

Date Sample was received: 9/20/94

Date Sample was extracted: 9/21/94.

Date Sample was Analyzed: 9/21/94.

Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): 5.0 mL

Weight of Sample Purged (g): ——

In Milliliters of Water: 50.0 mL

Percent Moisture (Not Decanted): ——

Analyzed By GC/P&T/FID: ______ HEC: ______ MS: —— PID: ______

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method: ______

Laboratory Comments: ______

Date Sample was Completed: 9/21/94.

Analyst: J. A. Campbell

All Data Reviewed and Accepted On: ______ Date

By Quality Assurance Officer: ______

Q.A./Q.C. Comments: ______

WV DIVISION OF ENVIRONMENTAL PROTECTION
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4900 Brenda Lane - Building #14
Charleston, WV 25312
(304) 558-4057

LAB SAMPLE #
GCL-9407603

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgeable Halocarbons 10 X TCL   BNA Extractables N/A X TCL

Purgeable Aromatics 10 X TCL   Pesticides/PCBs N/A X TCL

COMPOUND NAME	ug/Kg ug/L
trans-1,2-Dichloroethene	15.8
cis-1,2-Dichloroethene	146.1
Chloroform	86.4
Carbon Tetrachloride	228.9
Benzene	6.3 K
Trichloroethylene	1045.9
Chlorobenzene	3.6 K
No other 8260 Volatiles Detected	See Form 1.11

Laboratory Comments: K: See Data Reporting Qualifiers (Post for future reference)

Data Release Authorized by J. Campbell 9/21/94
Lab Supervisor Date

Sample Analyses Reported to: D. Cunningham

LAB SAMPLE #
GCL-9407603

Organics Analysis Data Sheet

Tentatively Identified Compounds

	CAS Number	Compound Name	Method	RT (min)	Estimated Concentration (ug/l or ug/kg)
1.	821-95-4	1-Undecene	8260	21.33	14
2.	629-50-5	Tridecane	8260	21.42	10
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

A Campbell

DATA REPORTING QUALIFIERS

One or more of the following specific data qualifiers were used in reporting results.

U - Indicates that the parameter was analyzed for but was not detected. The detection limit (Note 1) for the parameter was reported followed by the letter U (eg., 4.75U).

J - Indicates the presence of a parameter which met the identification criteria but was present at a concentration less than the method detection limit (MDL).

[redacted] Indicates the presence of a parameter at a concentration above the MDL but less than the lowest concentration level of the calibration table.

E - Indicates an estimated concentration for a tentatively identified compound where a 1:1 response to an internal standard was assumed.

C - Indicates that the identification of a parameter was confirmed by GC/MS. This qualifier is applied only to parameters which are not analyzed by a GC/MS method.

B - Indicates that the parameter was present in the method blank as well as the sample. The reported result should be viewed with caution and should be considered to be of questionable value.

X - Indicates that the paramter was identified and/or quantitated after the designated holding time specified in the methodology. The reported value is for informational purposes only.

<u>Note 1</u>: The laboratory has established minimum target values for each parameter. These values reflect the lower limits that the laboratory expects to achieve on routine samples and for which there is a high level of confidence in the results. These are not necessarily the method or instrument detection limits. The actual detection limits used with the U qualifier will be dependent on the particular sample and the concentration/dilution actions required to perform the analysis within the working range of the instrument(s). The detection limits (TDL) for a sample will be the minimum target values or some multiple of the minimum target values.

<u>Note 2</u>: The reported results are not corrected for recoveries.

<u>Note 3</u>: All soil sample results are based on dry weight.

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407802

Branch Submitting Sample: Waste Management.

Program for which samples are to be analyzed: RCRA

Field Sample Identification Number: Monsanto, Nitro (MW-6A).

Date Sample was taken: 9/21/94.

Sample Matrix: Water.

Date Sample was received: 9/22/94.

Date Sample was extracted: 9/27/94

Date Sample was Analyzed: 9/27/94

Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): —

Weight of Sample Purged (g): —

In Milliliters of Water: —

Percent Moisture (Not Decanted): —

Analyzed By GC/P&T/FID: HEC: MS — PID:

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method:

Laboratory Comments:

Date Sample was Completed: 9/27/94. Analyst: J. A. Campbell

All Data Reviewed and Accepted On: Date

By Quality Assurance Officer:

Q.A./Q.C. Comments:

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OFFICE OF WATER RESOURCES
GUTHRIE CENTER LABORATORY
4900 Brenda Lane - Building #14
Charleston, WV 25312
(304) 558-4057

LAB SAMPLE #
GCL-9407802

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgeable Halocarbons 1 X TCL BNA Extractables N/A X TCL
Purgeable Aromatics 1 X TCL Pesticides/PCBs N/A X TCL

COMPOUND NAME	ug/Kg ug/L
trans-1,2-Dichloroethene	4.3
cis-1,2-Dichloroethene	228.3
Chloroform	1.7 K
Benzene	20.3
Trichloroethene	90.0
Toluene	153.8
Chlorobenzene	2.9 K
Ethylbenzene	86.2
m/p-Xylene	150.2
o-Xylene	114.6
Isopropylbenzene	0.9 K
1,2,4-Trimethylbenzene	4.7 K
Isopropyltoluene	2.3 K

Laboratory Comments: No other 8260 Volatiles Detected — See attached report

Data Release Authorized by [signature] 9/27/94
Lab Supervisor Date

Sample Analyses Reported to: Dave Cunningham.

Data File: /chem/voa.i/VOA27SEP94.b/GCL9407802.d
Report Date: 27-Sep-1994 11:11

WV DEP-OWR Guthrie Center Lab

TENTATIVELY IDENTIFIED COMPOUNDS

Client Name:
Client Sample ID: Monsanto
Sample Location:
Lab Sample ID: GCL9407802
Sample Type: WATER
Analysis Type: VOA

Client SDG: VOA27SEP94.b
Sample Date:
Sample Point:
Date Received:

Level: LOW

Number TICs found: 18

CONCENTRATION UNITS:
(ug/L or ug/KG) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	
1. 74-93-1	Methanethiol	2.211	798.99	N
2. 75-08-1	Ethanethiol	3.290	266.65	N
3. 676-59-5	Phosphine, dimethyl-	3.624	2001.19	N
4. 624-89-5	Ethane, (methylthio)-	6.264	1269.12	N
5. 624-92-0	Disulfide, dimethyl	10.791	1705.91	N
6. 20333-39-5	Methyl ethyl disulphide	13.508	842.24	N
7. 873-94-9	Cyclohexanone, 3,3,5-trimeth	19.461	59.91	N
8. 100-68-5	Benzene, (methylthio)-	20.105	50.93	N
9. 4695-62-9	Bicyclo[2.2.1]heptan-2-one,	20.373	13.27	N
10. 298-06-6	Phosphorodithioic acid, O,O-	25.794	121.84	N

DATA REPORTING QUALIFIERS

One or more of the following specific data qualifiers were used in reporting results.

- U - Indicates that the parameter was analyzed for but was not detected. The detection limit (Note 1) for the parameter was reported followed by the letter U (eg., 4.75U).

- J - Indicates the presence of a parameter which met the identification criteria but was present at a concentration less than the method detection limit (MDL).

- [redacted] Indicates the presence of a parameter at a concentration above the MDL but less than the lowest concentration level of the calibration table.

- E - Indicates an estimated concentration for a tentatively identified compound where a 1:1 response to an internal standard was assumed.

- C - Indicates that the identification of a parameter was confirmed by GC/MS. This qualifier is applied only to parameters which are not analyzed by a GC/MS method.

- B - Indicates that the parameter was present in the method blank as well as the sample. The reported result should be viewed with caution and should be considered to be of questionable value.

- X - Indicates that the paramter was identified and/or quantitated after the designated holding time specified in the methodology. The reported value is for informational purposes only.

<u>Note 1</u>: The laboratory has established minimum target values for each parameter. These values reflect the lower limits that the laboratory expects to achieve on routine samples and for which there is a high level of confidence in the results. These are not necessarily the method or instrument detection limits. The actual detection limits used with the U qualifier will be dependent on the particular sample and the concentration/dilution actions required to perform the analysis within the working range of the instrument(s). The detection limits (TDL) for a sample will be the minimum target values or some multiple of the minimum target values.

<u>Note 2</u>: The reported results are not corrected for recoveries.

<u>Note 3</u>: All soil sample results are based on dry weight.

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407902

Branch Submitting Sample: Waste Management

Program for which samples are to be analyzed: RCRA

Field Sample Identification Number: Monsanto, Nitro (TD-3)

Date Sample was taken: 9/24/94.

Sample Matrix: Water

Date Sample was received: 9/26/94

Date Sample was extracted: 9/27/94

Date Sample was Analyzed: 9/27/94.

Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): ——

Weight of Sample Purged (g): ——

In Milliliters of Water: ——

Percent Moisture (Not Decanted): ——

Analyzed By GC/PID/FID: ______ HEC: ______ MS: —— PID: ______

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method: ______

Laboratory Comments: ______

Date Sample was Completed: 9/27/94. Analyst: J. A. Campbell

All Data Reviewed and Accepted On: ______ Date

By Quality Assurance Officer: ______

Q.A./Q.C. Comments: ______

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4900 Brenda Lane - Building #14
Charleston, WV 25312
(304) 558-4057

LAB SAMPLE #
GCL-9407902

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgable Halocarbons	1 x TQL	BNA Extractables	N/A x TQL
Purgable Aromatics	1 x TQL	Pesticides/PCBs	N/A x TQL

COMPOUND NAME	ug/Kg / ug/L
cis-1,2-Dichloroethene	2.8 K
Chloroform	2.0 K
Benzene	51.0
Trichloroethene	9.6
Toluene	5.7
Chlorobenzene	628.3
m,p-Xylene	1.2 K
o-Xylene	0.7 K
No other 8260 Volatiles Detected	—

Laboratory Comments: Sample was diluted 1:10 to bring chlorobenzene into the range of the calibration.

Data Release Authorized by J. A. Campbell 9/27/94
Lab Supervisor Date

Sample Analyses Reported to: Dave Cunningham

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407903

Branch Submitting Sample: Waste Management.

Program for which samples are to be analyzed: RCRA.

Field Sample Identification Number: Monsanto, Nitro (WT-5A).

Date Sample was taken: 9/24/94.
Sample Matrix: Water

Date Sample was received: 9/26/94.
Date Sample was extracted: 9/27/94

Date Sample was Analyzed: 9/27/94.
Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0
Dilution Factor (ml): —

Weight of Sample Purged (g): —
In Milliliters of Water: —

Percent Moisture (Not Decanted): —

Analyzed By GC/P&T/FID: HEC: MS: — PID:

E. P. A. Method Number: 8260

Analyzed By: J. Campbell
Miscellaneous Method:

Laboratory Comments:

Date Sample was Completed: 9/27/94. Analyst: J. A. Campbell

All Data Reviewed and Accepted On: Date

By Quality Assurance Officer:

Q.A./Q.C. Comments:

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SEP 28 1994
...ion of Environmental Protection
... Waste Management

WV DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
GUTHRIE CENTER LABORATORY
4900 Brenda Lane - Building #14
Charleston, WV 25312
(304) 558-4057

LAB SAMPLE #
GCL 9407903

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgable Halocarbons 1 X TQL
Purgable Aromatics 1 X TQL
BNA Extractables N/A X TQL
Pesticides/PCBs N/A X TQL

COMPOUND NAME	ug/Kg ug/L
No 8260 Volatiles Detected	—

Laboratory Comments:

Data Release Authorized by J. A. Campbell 9/27/94
Lab Supervisor Date

Sample Analyses Reported to: Dave Cunningham.

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407904

Branch Submitting Sample: Waste Management

Program for which samples are to be analyzed: RCRA.

Field Sample Identification Number: Monsanto, Nitro (WT-13A).

Date Sample was taken: 9/24/94 — Sample Matrix: Water

Date Sample was received: 9/26/94 — Date Sample was extracted: 9/27/94

Date Sample was Analyzed: 9/27/94. — Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0 — Dilution Factor (ml): —

Weight of Sample Purged (g): — — In Milliliters of Water: —

Percent Moisture (Not Decanted): —

Analyzed By GC/P&T/FID: ______ HEC: ______ MS: — ______ PID: ______

E. P. A. Method Number: 8260

Analyzed By: J. Campbell — Miscellaneous Method: ______

Laboratory Comments:

Date Sample was Completed: 9/27/94 — Analyst: J. C. Campbell

All Data Reviewed and Accepted On: ______ Date

By Quality Assurance Officer: ______

Q.A./Q.C. Comments:

WV DIVISION OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER RESOURCES
GUTHRIE CENTER LABORATORY
4900 Brenda Lane - Building #14
Charleston, WV 25312
(304) 558-4057

LAB SAMPLE #
GCL-9407904

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgeable Halocarbons 1 X TCL — BNA Extractables N/A X TCL

Purgeable Aromatics 1 X TCL — Pesticides/PCBs N/A X TCL

COMPOUND NAME	ug/Kg / ug/L
cis-1,2-Dichloroethene	13.4
Benzene	4.6 K
Trichloroethylene	851.1
Toluene	3.6 K
Chlorobenzene	4.8 K
No other 8260 Volatiles Detected	—

Laboratory Comments:

Data Release Authorized by J. A. Campbell 9/27/94
Lab Supervisor Date

Sample Analyses Reported to: Dave Cunningham

PLATES

APPENDIX E

WVDNR COMPLIANCE MONITORING REPORT

Mark Tucker
Roux Ass.

DEPARTMENT OF COMMERCE, LABOR & ENVIRONMENTAL RESOURCES

DIVISION OF ENVIRONMENTAL PROTECTION

1356 Hansford Street
Charleston, WV 25301-1401

Gaston Caperton
Governor

John M. Ranson
Cabinet Secretary

David C. Callaghan
Director

Ann A. Spaner
Deputy Director

October 11, 1994

Ms. Rhonda Hooper
Monsanto Chemical Company
No. 1 Monsanto Road
Nitro, West Virginia 25143

Dear Ms. Hooper:

Enclosed is a copy of the **Compliance Monitoring Evaluation (CME)** report completed on your facility by a representative of the Chief of the Waste Management Section. This report is based on the inspection conducted on September 23, 1994.

The United States Environmental Protection Agency has been notified so that this report can become a permanent to the addition to the compliance history of this facility.

Thank you for your assistance and cooperation during this inspection. If you have any questions concerning the inspection or attached report, please feel free to contact Inspector David Cunningham at 558-5989.

Sincerely,

Thomas A. Fisher

Thomas A. Fisher
Inspector Supervisor - Southern Unit
Compliance Monitoring/Enforcement
Office of Waste Management

kw

Enclosure

cc: Dave Cunningham, Inspector
Jean Sofield, U.S. EPA Region III
File

INSPECTION FACT SHEET

COMPANY NAME: Monsanto Chemical Company **I.D.#:** WVD039990965

MAILING ADDRESS: No. 1 Monsanto Road
Nitro, WV 25143

TYPE OF FACILITY: Permitted TSD/Generator

LOCATION: Same

COUNTY: Putnam (079)

COMPANY CONTACT: Rhonda Hooper

HANDLING CODES:

TELEPHONE: 304-759-4400 or 4368

PURPOSE: To conduct a RCRA Compliance Monitoring Evaluation Inspection.

APPLICABLE REGULATIONS:
West Virginia Hazardous Waste Management Act, Chapter 22-18 and 40 CFR, Parts 260-280.

LIST OF CHEMICALS:
(For Small Quantity Generators, list amount of waste, how it is handled, where it goes).

DATE INSPECTED: September 19, 21, 23, 1994 ___ VIOLATIONS

INSPECTORS: (1) Dave Cunningham ___ NO VIOLATIONS

(2) Henry Haas

DATE PREPARED: September 26, 1994

PREPARED BY: Dave Cunningham

COMPLIANCE MONITORING EVALUATION

RE: Monsanto Chemical Company
No. 1 Monsanto Road
Nitro, West Virginia 25143
EPA Identification Number: WVD039990965

DATE INSPECTED: September 19, 21, and 23, 1994

INSPECTED BY: Dave Cunningham, WV DEP/OWM
Henry Haas, WV DEP/OWM

REPORT BY: Dave Cunningham

On September 19, 1994 at approximately 1045 hours the above referenced West Virginia Division of Environmental Protection Office of Waste Management personnel arrived at the Monsanto Nitro facility to conduct a Compliance Monitoring Evaluation. This inspection was to be made in conjuncture with the work being done by ROUX Associates Inc. of West Deptford, New Jersey on Monsanto's RCRA Facility Investigation (RFI). Upon arriving at the facility, we signed in at the front desk and were met by Ms. Rhonda Hooper of Monsanto. Ms. Hooper instructed us to report to the front gate guard house and watch the plant safety video prior to entering the plant. We proceeded to do this and when finished signed in at the front gate.

Ms. Hooper met us at the front gate and we followed her to the Southeast corner of the facility property to witness the purging and sampling of monitoring well No. MW-1A and 1B. The company was having approximately 65 wells sampled during this RFI. We planned to split six of these samples with the company. The first split was to be MW-1A. Mr. Scott Anderson was in charge of the ROUX Associates Inc. crew doing the work on the wells for Monsanto. This crew began the set up on MW-1A and 1B when we arrived. The "A" and "B" numbering on the wells corresponds to the groundwater aquifers at the site. All "A" wells are supposed to be screened and developed to the upper zone of the aquifer and the "B" wells are supposed to be screened and developed to the lower zone of the same aquifer. ROUX Associates Inc. appeared to do a good job of checking the purge water pumping rate and volume and preparing each well for sampling.

We witnessed the preparation work on both MW-1A and 1B and obtained split samples of MW-1A at approximately 1300 to 1320 hours. The analysis to be performed on both of these wells consisted of VOC, BN/AE, Metals, TOC and TOX. At about 1330 we finished with this well and departed the facility for lunch.

At approximately 1410 we returned to the facility, signed in at the front gate and proceeded to the Southwest corner of the property (on the Kanawha River bank) to witness sampling and split samples from well No. MW-23A. Upon arriving at this well, the ROUX crew had just finished the purging of the well and was waiting for it to recharge for the sampling. At about 1430 we split samples of the MW-23A well. (The analysis results for the VOA show obvious problems with this well. See analysis). This concluded our sampling for this date, so we thanked Mr. Anderson and departed the facility at about 1500 hours.

On September 21, 1994 at approximately 0900 we again arrived at the Monsanto Nitro facility and signed in at the front gate and met with Ms. Rhonda Hooper. We followed Ms. Hooper to where the ROUX team was working on well No. MW-17A and 17B along the southern edge of the facility property. We witnessed the purging and sampling of these wells. When the team finished these wells, we followed them to well No. MW-6A and 6B at approximately 1018. This well is located along the Kanawha River bank on the Northeast corner of the Monsanto production property. The ROUX team set up their sampling equipment and began purging the proper volume of water from the MW-6A well. After purging and monitoring the well, we had to wait for about 10 to 15 minutes for the well to recharge enough for sampling. (Like most of the "A" wells along the river bank, this one had a very slow recharge rate). At 1100 hours we began splitting samples at this well. Once again this well was to be sampled for VOA, BN/AE, Metals, TOC and TOX. It should be noted that the liquid from this well was very black in color and had a great deal of solids in it as well as a very strong chemical odor similar to the ambient air at the Monsanto facility. After obtaining these samples from MW-6A, we witnessed the purging of MW-6B. The liquid from this well appeared clear and normal in color. This concluded our sampling for this date and departed the facility at approximately 1140 hours.

On September 23, 1994 at approximately 0945 hours Henry Haas and I returned to the Monsanto, Nitro facility to split samples at the wells near the Monsanto waste treatment unit and decontaminated 2, 4, 5T building. Upon arriving at the site, we signed in at the front office and gate and proceeded to the waste treatment area where the ROUX team was already set up and preparing well No. WT-5A and 5B. After the team purged the 6-A well, we split samples with them. The parameters to be analyzed on this well are the same as the previous three we had split with the ROUX team.

At about 1025 we moved to well No. TD-3 on the Kanawha River bank behind the decontaminated 2,4,5T building. The ROUX team again set up on this well and began to purge the proper well water volume from it. The water level was so low in this well and the recharge rate so slow that the team had to hand bail this well instead of pumping it as they had on all the previous wells. After purging 3 gallons of water from this well, we again split samples with them. The liquid in this well was brackish and had a chemical odor. The parameters to be analyzed on this well were the same as the others with the addition of Dioxins and Dibenzofurans. We finished sampling of this well at about 1100 hours.

We then proceeded to well No. WT-13A to take our last split sample. The ROUX team set up on the well and began their measurements and purging. After they had completed all of this, we split samples of this well at approximately 1150. This well also was to be analyzed for VOA, BN/AE, Metals, TOC, TOX, Dioxins, and Dibenzofurans.

This concluded our sampling for the RFI and CME for this facility. We thanked Mr. Anderson for his help and departed the facility at about 1208 hours.

SAMPLE ANALYSIS RESULTS

Find attached the results of sample analysis for well Numbers MW-6A, TD-3, WT-5A, WT-13, MW-1A and MW-23A. These samples were split with company and proper chain of custody followed until they were delivered to the Guthrie laboratory for analysis of VOA.

COMPLIANCE EVALUATION

The compliance evaluation for this facility is pending at this time until further completion of the Corrective Action process. There were no problems noted during our visits regarding the facility's sample methods or sample handling procedures.

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407602

Branch Submitting Sample: Waste Management

Program for which samples are to be analyzed: RCRA (INFO ONLY).

Field Sample Identification Number: Monsanto MW-1A

Date Sample was taken: 9/19/94

Sample Matrix: Water

Date Sample was received: 9/20/94.

Date Sample was extracted: 9/21/94

Date Sample was Analyzed: 9/21/94.

Ph of Sample adjusted to: N/A

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): —

Weight of Sample Purged (g): —

In Milliliters of Water: —

Percent Moisture (Not Decanted): —

Analyzed By GC/P&T/FID: ______ HEC: ______ MS: — PID: ______

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method: ______

Laboratory Comments: ______

Date Sample was Completed: 9/21/94.

Analyst: J. Campbell

All Data Reviewed and Accepted On: ______ Date

By Quality Assurance Officer: ______

Q.A./Q.C. Comments: ______

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SEP 22 1994

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OFFICE OF WATER RESOURCES
GUTHRIE CENTER LABORATORY
4900 Brenda Lane - Building #14
Charleston, WV 25312
(304) 558-4057

ORGANICS ANALYSIS DATA SHEET

LAB SAMPLE #
GCL-9407602

REPORTING LIMITS:

Purgable Halocarbons 1 x TCL
BNA Extractables N/A x TCL
Purgable Aromatics 1 x TCL
Pesticides/PCBs N/A x TCL

COMPOUND NAME	ug/Kg ug/L
Chloroform	4.6
No other 8260 Volatiles Detected	See Form 1.11

Laboratory Comments:

Data Release Authorized by J. Campbell 9/21/94
Lab Supervisor Date

Sample Analyses Reported to: D. Cunningham

LAB SAMPLE #
GCL-9407602

Organics Analysis Data Sheet

Tentatively Identified Compounds

CAS Number	Compound Name	Method	RT (min)	Estimated Concentration (ug/l or ug/kg)
1. 112-41-4	1-Dodecene	8260	21.35	43
2. 629-50-5	Tridecane	8260	21.43	11
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

AOC

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407603

Branch Submitting Sample: Waste Management

Program for which samples are to be analyzed: RCRA (INFO ONLY)

Field Sample Identification Number: Monsanto MW-23 A

Date Sample was taken: 9/19/94

Sample Matrix: Water.

Date Sample was received: 9/20/94

Date Sample was extracted: 9/21/94.

Date Sample was Analyzed: 9/21/94.

Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): 5.0 mL

Weight of Sample Purged (g): ——

In Milliliters of Water: 50.0 mL

Percent Moisture (Not Decanted): ——

Analyzed By GC/P&T/FID: ______ HEC: ______ MS: —— PID: ______

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method: ______

Laboratory Comments: ______

Date Sample was Completed: 9/21/94.

Analyst: J. A. Campbell

All Data Reviewed and Accepted On: ______ Date

By Quality Assurance Officer: ______

Q.A./Q.C. Comments: ______

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OFFICE OF WATER RESOURCES
GUTHRIE CENTER LABORATORY
4900 Brenda Lane - Building #14
Charleston, WV 25312
(304) 558-4057

LAB SAMPLE #
GCL-9407603

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgable Halocarbons 10 x TCL SNA Extractables N/A x TCL

Purgable Aromatics 10 x TCL Pesticides/PCBs N/A x TCL

COMPOUND NAME	ug/Kg ug/L
trans-1,2-Dichloroethene	15.8
cis-1,2-Dichloroethene	146.1
Chloroform	86.4
Carbon Tetrachloride	228.9
Benzene	6.3 K
Trichloroethylene	1045.9
Chlorobenzene	3.6 K
No other 8260 Volatiles Detected	See Form 1.11

Laboratory Comments: K: See Data Reporting Qualifiers (Post for future reference)

Data Release Authorized by J. Campbell 9/21/94
Lab Supervisor Date

Sample Analyses Reported to: D. Cunningham

LAB SAMPLE #
GCL-9407603

Organics Analysis Data Sheet

Tentatively Identified Compounds

	CAS Number	Compound Name	Method	RT (min)	Estimated Concentration (ug/l or ug/kg)
1.	821-95-4	1-Undecene	8260	21.33	14
2.	629-50-5	Tridecane	8260	21.42	10
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
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19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

A Campbell

DATA REPORTING QUALIFIERS

One or more of the following specific data qualifiers were used in reporting results.

U - Indicates that the parameter was analyzed for but was not detected. The detection limit (Note 1) for the parameter was reported followed by the letter U (eg., 4.75U).

J - Indicates the presence of a parameter which met the identification criteria but was present at a concentration less than the method detection limit (MDL).

[redacted] Indicates the presence of a parameter at a concentration above the MDL but less than the lowest concentration level of the calibration table.

E - Indicates an estimated concentration for a tentatively identified compound where a 1:1 response to an internal standard was assumed.

C - Indicates that the identification of a parameter was confirmed by GC/MS. This qualifier is applied only to parameters which are not analyzed by a GC/MS method.

B - Indicates that the parameter was present in the method blank as well as the sample. The reported result should be viewed with caution and should be considered to be of questionable value.

X - Indicates that the paramter was identified and/or quantitated after the designated holding time specified in the methodology. The reported value is for informational purposes only.

Note 1: The laboratory has established minimum target values for each parameter. These values reflect the lower limits that the laboratory expects to achieve on routine samples and for which there is a high level of confidence in the results. These are not necessarily the method or instrument detection limits. The actual detection limits used with the U qualifier will be dependent on the particular sample and the concentration/dilution actions required to perform the analysis within the working range of the instrument(s). The detection limits (TDL) for a sample will be the minimum target values or some multiple of the minimum target values.

Note 2: The reported results are not corrected for recoveries.

Note 3: All soil sample results are based on dry weight.

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE # GCL-9407802

Branch Submitting Sample: Waste Management.

Program for which samples are to be analyzed: RCRA

Field Sample Identification Number: Monsanto, Nitro (MW-6A).

Date Sample was taken: 9/21/94.

Sample Matrix: Water.

Date Sample was received: 9/22/94.

Date Sample was extracted: 9/27/94

Date Sample was Analyzed: 9/27/94

Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): —

Weight of Sample Purged (g): —

In Milliliters of Water: —

Percent Moisture (Not Decanted): —

Analyzed By GC/P&T/FID: ____ HEC: ____ MS — PID: ____

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method: ____

Laboratory Comments: ____

Date Sample was Completed: 9/27/94. Analyst: J. A. Campbell

All Data Reviewed and Accepted On: ____ Date

By Quality Assurance Officer: ____

Q.A./Q.C. Comments: ____

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4900 Brenda Lane - Building #14
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(304) 558-4057

LAB SAMPLE #
GCL-9407802

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgeable Halocarbons 1 x TQL

Purgeable Aromatics 1 x TQL

BNA Extractables N/A x TQL

Pesticides/PCBs N/A x TQL

COMPOUND NAME	ug/Kg ug/L
trans-1,2-Dichloroethene	4.3
cis-1,2-Dichloroethene	228.3
Chloroform	1.7 K
Benzene	20.3
Trichloroethene	90.0
Toluene	153.8
Chlorobenzene	2.9 K
Ethylbenzene	86.2
m/p-Xylene	150.2
o-Xylene	114.6
Isopropylbenzene	0.9 K
1,2,4-Trimethylbenzene	4.7 K
Isopropyltoluene	2.3 K

Laboratory Comments: No other 8260 Volatiles Detected — See attached report

Data Release Authorized by [signature] 9/27/94
Lab Supervisor Date

Sample Analyses Reported to: Dave Cunningham.

WV DEP-OWR Guthrie Center Lab

TENTATIVELY IDENTIFIED COMPOUNDS

Client Name:
Client Sample ID: Monsanto
Sample Location:
Lab Sample ID: GCL9407802
Sample Type: WATER
Analysis Type: VOA

Client SDG: VOA27SEP94.b
Sample Date:
Sample Point:
Date Received:

Level: LOW

Number TICs found: 18

CONCENTRATION UNITS:
(ug/L or ug/KG) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	
1. 74-93-1	Methanethiol	2.211	798.99	N
2. 75-08-1	Ethanethiol	3.290	266.65	N
3. 676-59-5	Phosphine, dimethyl-	3.624	2001.19	N
4. 624-89-5	Ethane, (methylthio)-	6.264	1269.12	N
5. 624-92-0	Disulfide, dimethyl	10.791	1705.91	N
6. 20333-39-5	Methyl ethyl disulphide	13.508	842.24	N
7. 873-94-9	Cyclohexanone, 3,3,5-trimeth	19.461	59.91	N
8. 100-68-5	Benzene, (methylthio)-	20.105	50.93	N
9. 4695-62-9	Bicyclo[2.2.1]heptan-2-one,	20.373	13.27	N
10. 298-06-6	Phosphorodithioic acid, O,O-	25.794	121.84	N

DATA REPORTING QUALIFIERS

One or more of the following specific data qualifiers were used in reporting results.

U - Indicates that the parameter was analyzed for but was not detected. The detection limit (Note 1) for the parameter was reported followed by the letter U (eg., 4.75U).

J - Indicates the presence of a parameter which met the identification criteria but was present at a concentration less than the method detection limit (MDL).

[redacted] Indicates the presence of a parameter at a concentration above the MDL but less than the lowest concentration level of the calibration table.

E - Indicates an estimated concentration for a tentatively identified compound where a 1:1 response to an internal standard was assumed.

C - Indicates that the identification of a parameter was confirmed by GC/MS. This qualifier is applied only to parameters which are not analyzed by a GC/MS method.

B - Indicates that the parameter was present in the method blank as well as the sample. The reported result should be viewed with caution and should be considered to be of questionable value.

X - Indicates that the paramter was identified and/or quantitated after the designated holding time specified in the methodology. The reported value is for informational purposes only.

Note 1: The laboratory has established minimum target values for each parameter. These values reflect the lower limits that the laboratory expects to achieve on routine samples and for which there is a high level of confidence in the results. These are not necessarily the method or instrument detection limits. The actual detection limits used with the U qualifier will be dependent on the particular sample and the concentration/dilution actions required to perform the analysis within the working range of the instrument(s). The detection limits (TDL) for a sample will be the minimum target values or some multiple of the minimum target values.

Note 2: The reported results are not corrected for recoveries.

Note 3: All soil sample results are based on dry weight.

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407902

Branch Submitting Sample: Waste Management

Program for which samples are to be analyzed: RCRA

Field Sample Identification Number: Monsanto, Nitro (TD-3)

Date Sample was taken: 9/24/94.

Sample Matrix: Water

Date Sample was received: 9/26/94.

Date Sample was extracted: 9/27/94

Date Sample was Analyzed: 9/27/94.

Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): —

Weight of Sample Purged (g): —

In Milliliters of Water: —

Percent Moisture (Not Decanted): —

Analyzed By GC/PID/FID: ______ HEC: ______ MS: — PID: ______

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method: ______

Laboratory Comments: ______

Date Sample was Completed: 9/27/94. Analyst: J. A. Campbell

All Data Reviewed and Accepted On: ______ Date

By Quality Assurance Officer: ______

Q.A./Q.C. Comments: ______

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LAB SAMPLE #
GCL-9407902

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgeable Halocarbons 1 x TQL

Purgeable Aromatics 1 x TQL

BNA Extractables N/A x TQL

Pesticides/PCBs N/A x TQL

COMPOUND NAME	ug/Kg ug/L
cis-1,2-Dichloroethene	2.8 K
Chloroform	2.0 K
Benzene	51.0
Trichloroethene	9.6
Toluene	5.7
Chlorobenzene	628.3
m,p-Xylene	1.2 K
o-Xylene	0.7 K
No other 8260 Volatiles Detected	—

Laboratory Comments: Sample was diluted 1:10 to bring chlorobenzene into the range of the calibration.

Data Release Authorized by J. A. Campbell 9/27/94
Lab Supervisor Date

Sample Analyses Reported to: Dave Cunningham

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407903

Branch Submitting Sample: Waste Management.

Program for which samples are to be analyzed: RCRA.

Field Sample Identification Number: Monsanto, Nitro (WT-5A).

Date Sample was taken: 9/24/94.

Sample Matrix: Water

Date Sample was received: 9/26/94.

Date Sample was extracted: 9/27/94

Date Sample was Analyzed: 9/27/94.

Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): —

Weight of Sample Purged (g): —

In Milliliters of Water: —

Percent Moisture (Not Decanted): —

Analyzed By GC/P&T/FID: ______ HEC: ______ MS: — ______ PID: ______

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method: ______

Laboratory Comments:

Date Sample was Completed: 9/27/94.

Analyst: J. A. Campbell

All Data Reviewed and Accepted On: ______ Date

By Quality Assurance Officer: ______

Q.A./Q.C. Comments:

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...ion of Environmental Protection
... Waste Management

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Charleston, WV 25312
(304) 558-4057

LAB SAMPLE #
GCL 9407903

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgable Halocarbons 1 X TCL — BNA Extractables N/A X TCL

Purgable Aromatics 1 X TCL — Pesticides/PCBs N/A X TCL

COMPOUND NAME	ug/Kg ug/L
No 8260 Volatiles Detected	—

Laboratory Comments:

Data Release Authorized by J. A. Campbell 9/27/94
Lab Supervisor Date

Sample Analyses Reported to: Dave Cunningham

ORGANICS ANALYSIS DATA SHEET

VOLATILE COMPOUNDS

LAB SAMPLE #
GCL-9407904

Branch Submitting Sample: Waste Management.

Program for which samples are to be analyzed: RCRA.

Field Sample Identification Number: Monsanto, Nitro (WT-13A).

Date Sample was taken: 9/24/94

Sample Matrix: Water

Date Sample was received: 9/26/94

Date Sample was extracted: 9/27/94

Date Sample was Analyzed: 9/27/94.

Ph of Sample adjusted to: N/A.

Volume of Water Purged (ml): 5.0

Dilution Factor (ml): —

Weight of Sample Purged (g): —

In Milliliters of Water: —

Percent Moisture (Not Decanted): —

Analyzed By GC/P&T/FID: ______ HEC: ______ MS: — PID: ______

E. P. A. Method Number: 8260

Analyzed By: J. Campbell

Miscellaneous Method: ______

Laboratory Comments: ______

Date Sample was Completed: 9/27/94

Analyst: J. C. Campbell

All Data Reviewed and Accepted On: ______ Date

By Quality Assurance Officer: ______

Q.A./Q.C. Comments: ______

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LAB SAMPLE #
GCL-9407904

ORGANICS ANALYSIS DATA SHEET

REPORTING LIMITS:

Purgeable Halocarbons 1 x TCL — BNA Extractables N/A x TCL

Purgeable Aromatics 1 x TCL — Pesticides/PCBs N/A x TCL

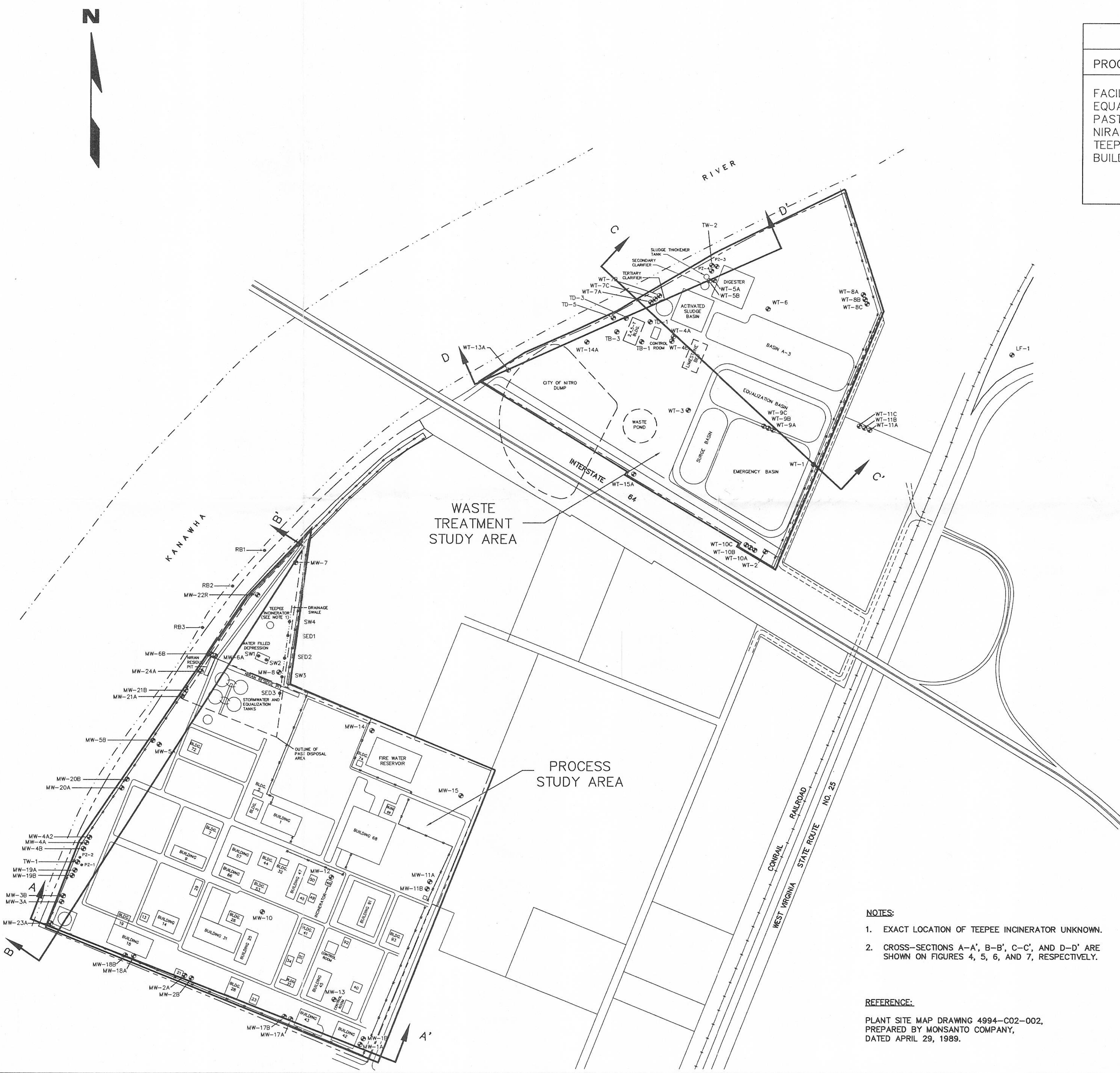
COMPOUND NAME	ug/Kg ug/L
cis-1,2-Dichloroethene	13.4
Benzene	4.6 K
Trichloroethylene	851.1
Toluene	3.6 K
Chlorobenzene	4.8 K
No other 8260 Volatiles Detected	———

Laboratory Comments:

Data Release Authorized by J. A. Campbell 9/27/94
Lab Supervisor Date

Sample Analyses Reported to: Dave Cunningham

PLATES



SWMU IDENTIFICATION	
PROCESS STUDY AREA	WASTE TREATMENT STUDY AREA
FACILITY SEWER SYSTEM EQUALIZATION TANKS PAST DISPOSAL AREA NIRAN RESIDUE PITS TEEPEE INCINERATOR BUILDING 46 INCINERATOR	WASTEWATER TREATMENT PLANT EMERGENCY BASIN SURGE BASIN EQUALIZATION BASIN LIMESTONE BED WASTE POND DECONTAMINATED 2,4,5-T BUILDING CITY OF NITRO DUMP

LEGEND

- RB1 — SOIL, SEDIMENT, AND SURFACE WATER SAMPLING LOCATION AND IDENTIFICATION
- WT-1 — MONITORING WELL LOCATION AND IDENTIFICATION
- PZ-1 — PIEZOMETER LOCATION AND IDENTIFICATION
- A — A' — CROSS-SECTION LINE
- APPROXIMATE PROPERTY LINE
- EDGE OF WATER
- DRAINAGE SWALE
- FENCE

400' 0' 400'

NOTES:

1. EXACT LOCATION OF TEEPEE INCINERATOR UNKNOWN.
2. CROSS-SECTIONS A-A', B-B', C-C', AND D-D' ARE SHOWN ON FIGURES 4, 5, 6, AND 7, RESPECTIVELY.

REFERENCE:

PLANT SITE MAP DRAWING 4994-C02-002, PREPARED BY MONSANTO COMPANY, DATED APRIL 29, 1989.

Title:

SITE PLAN

NITRO, WEST VIRGINIA

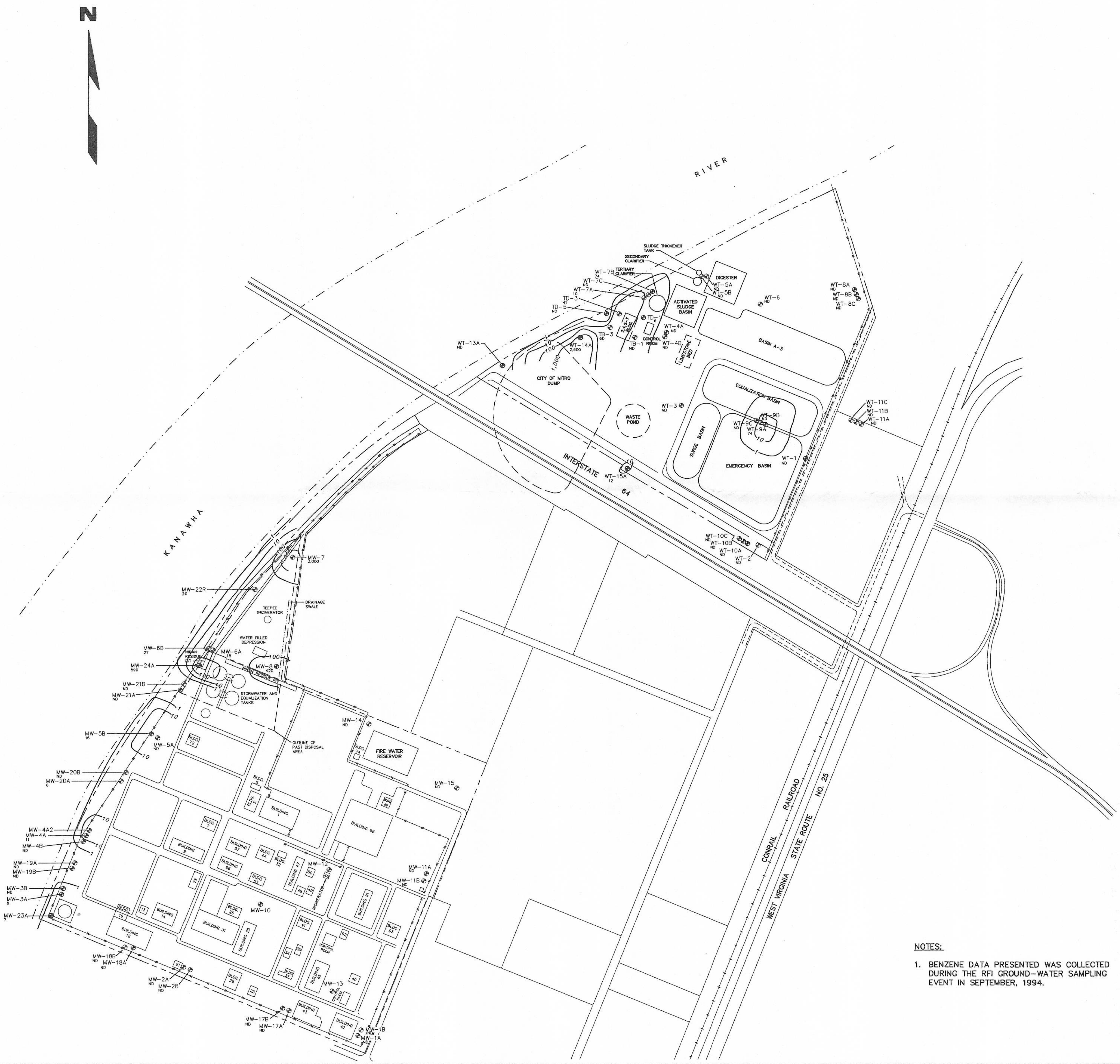
Prepared For:

MONSANTO COMPANY

ROUX ASSOCIATES INC *Environmental Consulting & Management*	Compiled by: S.E.A.	Date: 04/95	Plate
	Prepared by: B.R.M.	Scale: SHOWN	1
	Project Mgr: J.T.C.	Revision: FINAL	
	Proj No: 06619J03	File No: 06619037	

32 = 62

N
DIRECTION OF FLOW
KANAWHA
RIVER
ARMOUR
CREEK
CONRAIL RAILROAD
INTERSTATE 64
WEST VIRGINIA STATE ROUTE NO. 25
BASIN A-3
EQUALIZATION BASIN
SURGE BASIN
EMERGENCY BASIN
WASTE POND
CITY OF NITRO DUMP
DIGESTER
ACTIVATED SLUDGE BASIN
SLUDGE THICKENER TANK
SECONDARY CLARIFIER
TERTIARY CLARIFIER
CONTROL ROOM
TEEPEE INCINERATOR
DRAINAGE SWALE
WATER FILLED DEPRESSION
STORMWATER AND EQUALIZATION TANKS
OUTLINE OF PAST DISPOSAL AREA
FIRE WATER RESERVOIR
LEGEND
WT-1 MONITORING WELL LOCATION AND IDENTIFICATION
571.78 WATER-LEVEL ELEVATION (FEET) RELATIVE TO A COMMON DATUM
* ANOMALOUS WATER-LEVEL ELEVATION WHICH DOES NOT FIT CONTOUR LINES
566 LINE OF EQUAL WATER-LEVEL ELEVATION (FEET) RELATIVE TO A COMMON DATUM
INFERRED GROUNDWATER FLOW DIRECTION
EDGE OF WATER
DRAINAGE SWALE
FENCE
APPROXIMATE PROPERTY LINE
400' 0' 400'
Title:
GROUND-WATER ELEVATION CONTOUR MAP SEPTEMBER 20, 1994
NITRO, WEST VIRGINIA
Prepared For:
MONSANTO COMPANY
ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management
Compiled by: M.S.T.
Prepared by: B.R.M.
Project Mgr: J.T.C.
Proj No: 06619J03
Date: 04/95
Scale: SHOWN
Revision: FINAL
File No: 06619045
Plate 2



LEGEND

WT-1	MONITORING WELL LOCATION AND IDENTIFICATION
590	CONCENTRATION OF BENZENE IN MICROGRAMS PER LITER (µg/l)
—— 10 ——	LINE ENCLOSING SAMPLE LOCATIONS WHERE CONCENTRATIONS ARE GREATER THAN SPECIFIED VALUE
—·—··—·—	EDGE OF WATER
-·-·-·-·-	DRAINAGE SWALE
—×—×—	FENCE
—— — — ——	APPROXIMATE PROPERTY LINE

400' 0' 400'

NOTES:

1. BENZENE DATA PRESENTED WAS COLLECTED DURING THE RFI GROUND-WATER SAMPLING EVENT IN SEPTEMBER, 1994.

Title:

BENZENE DISTRIBUTION IN GROUND WATER

NITRO, WEST VIRGINIA

Prepared For:

MONSANTO COMPANY

ROUX ASSOCIATES INC *Environmental Consulting & Management*	Compiled by: S.E.A.	Date: 04/95	Plate
	Prepared by: M.J.V.	Scale: SHOWN	3
	Project Mgr: J.T.C.	Revision: FINAL	
	Proj No: 06619J03	File No: 06619032	

LEGEND

WT-1	MONITORING WELL LOCATION AND IDENTIFICATION
1,360	CONCENTRATION OF TOTAL CHLORINATED PHENOL COMPOUNDS IN MICROGRAMS PER LITER (µg/l)
—10—	LINE ENCLOSING SAMPLE LOCATIONS WHERE CONCENTRATIONS ARE GREATER THAN SPECIFIED VALUE
	EDGE OF WATER
	DRAINAGE SWALE
	FENCE
	APPROXIMATE PROPERTY LINE

NOTES:

1. TOTAL CHLORINATED PHENOLS DATA PRESENTED WAS COLLECTED DURING THE RFI GROUND-WATER SAMPLING EVENT IN SEPTEMBER, 1994.

Title:

TOTAL CHLORINATED PHENOLS DISTRIBUTION IN GROUND WATER

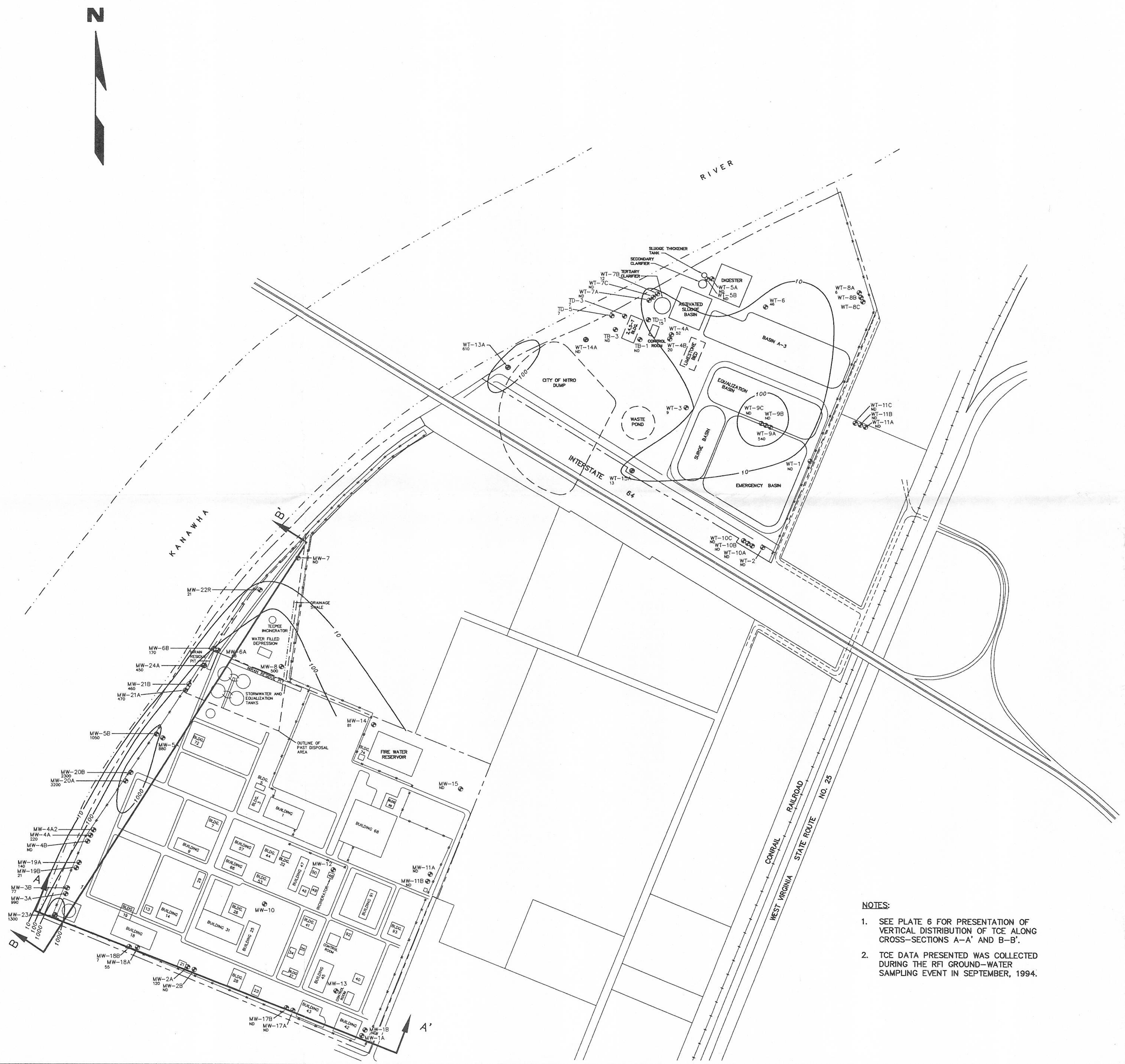
NITRO, WEST VIRGINIA

Prepared For:

MONSANTO COMPANY

ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: S.E.A.	Date: 04/95	Plate
Prepared by: M.J.V.	Scale: SHOWN	4
Project Mgr: J.T.C.	Revision: FINAL	
Proj No: 06619J03	File No: 06619033	



LEGEND

WT-1	MONITORING WELL LOCATION AND IDENTIFICATION
590	CONCENTRATION OF TCE IN MICROGRAMS PER LITER ($\mu g/l$)
A A'	CROSS-SECTION LINE
10	LINE ENCLOSING SAMPLE LOCATIONS WHERE CONCENTRATIONS ARE GREATER THAN SPECIFIED VALUE
	EDGE OF WATER
	DRAINAGE SWALE
	FENCE
	APPROXIMATE PROPERTY LINE

400' 0' 400'

NOTES:

1. SEE PLATE 6 FOR PRESENTATION OF VERTICAL DISTRIBUTION OF TCE ALONG CROSS-SECTIONS A-A' AND B-B'.
2. TCE DATA PRESENTED WAS COLLECTED DURING THE RFI GROUND-WATER SAMPLING EVENT IN SEPTEMBER, 1994.

Title:

TCE DISTRIBUTION IN GROUND WATER

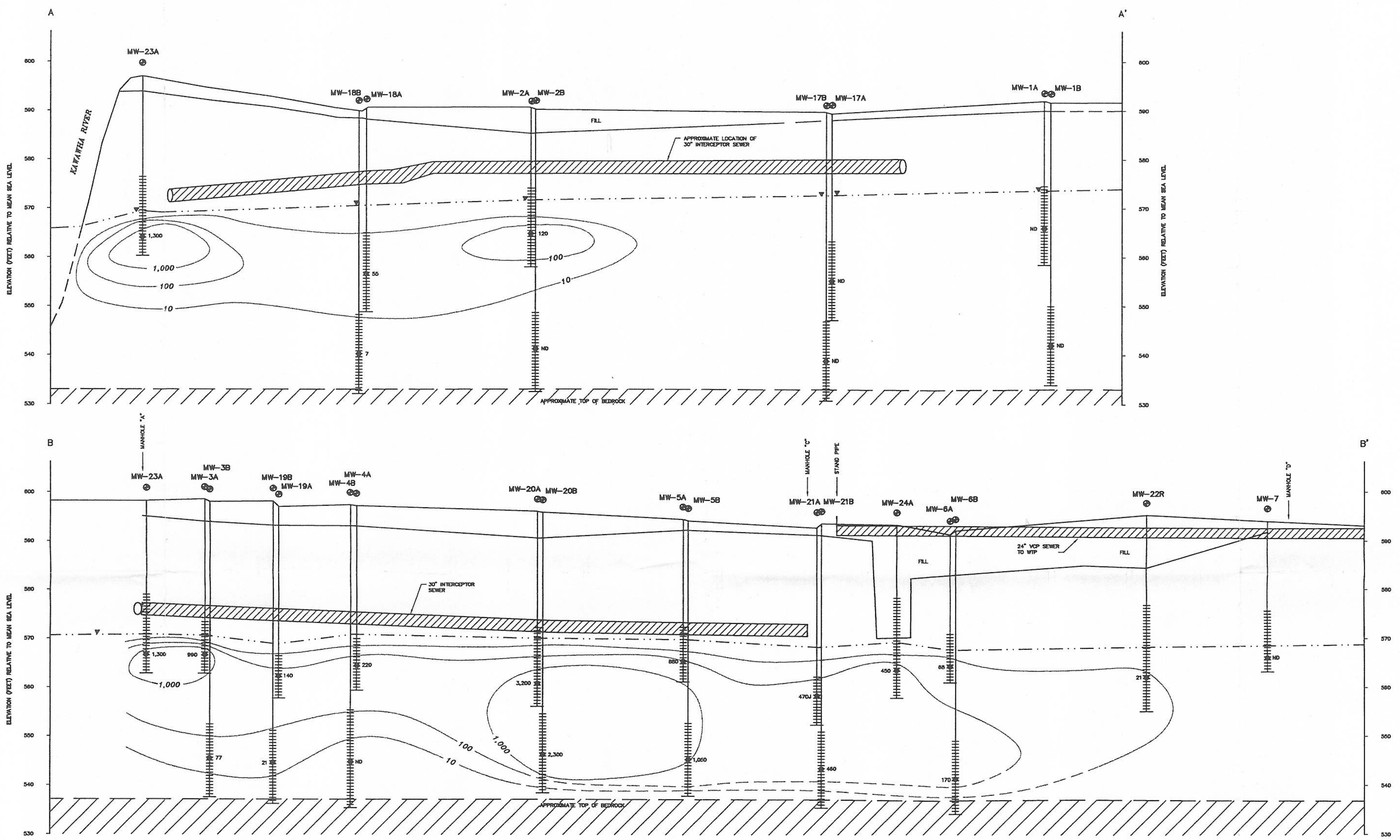
NITRO, WEST VIRGINIA

Prepared For:

MONSANTO COMPANY

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: S.E.A.	Date: 04/95	Plate
Prepared by: M.J.V.	Scale: SHOWN	5
Project Mgr: J.T.C.	Revision: FINAL	
Proj No: 06619J03	File No: 06619038	



LEGEND

MW-1A	MONITORING WELL LOCATION AND IDENTIFICATION
120	TCE CONCENTRATION ($\mu g/l$) PLACED AT MID-POINT OF WELL SCREEN BELOW WATER-TABLE ELEVATION
ND	NOT DETECTED
1,000	LINE OF EQUAL TCE CONCENTRATION IN GROUND WATER ($\mu g/l$) (DASHED WHERE INFERRED)
	BEDROCK
	WELL CASING
	WELL SCREEN
	BOTTOM OF WELL
	WATER TABLE SURFACE
	FACILITY SEWER SYSTEM

VERTICAL 20'
0 200'
HORIZONTAL

NOTES:

1. REFERENCE PLATE 5 FOR LOCATIONS OF CROSS-SECTIONS A-A' AND B-B'.

Title:

CROSS-SECTIONS SHOWING VERTICAL DISTRIBUTION OF TCE IN GROUND WATER

NITRO, WEST VIRGINIA

Prepared For:

MONSANTO COMPANY

ROUX ASSOCIATES INC Environmental Consulting & Management	Compiled by: S.E.A.	Date: 04/95	Plate
	Prepared by: M.J.V.	Scale: SHOWN	6
	Project Mgr: J.T.C.	Revision: FINAL	
	Proj No: 06619J03	File No: 06619046	

LEGEND

WT-1A	MONITORING WELL LOCATION AND IDENTIFICATION
	BOUNDARIES OF STUDY AREAS
	APPROXIMATE PROPERTY LINE
	EDGE OF WATER
	DRAINAGE SWALE
	FENCE
	PRIMARY AREA NO.1
	PRIMARY AREA NO.2
	PRIMARY AREA NO. 3

400' 0' 400'

NOTES:

1. AREAS SHOWN WILL BE EVALUATED FOR POTENTIAL STABILIZATION/CORRECTIVE MEASURES.

Title:

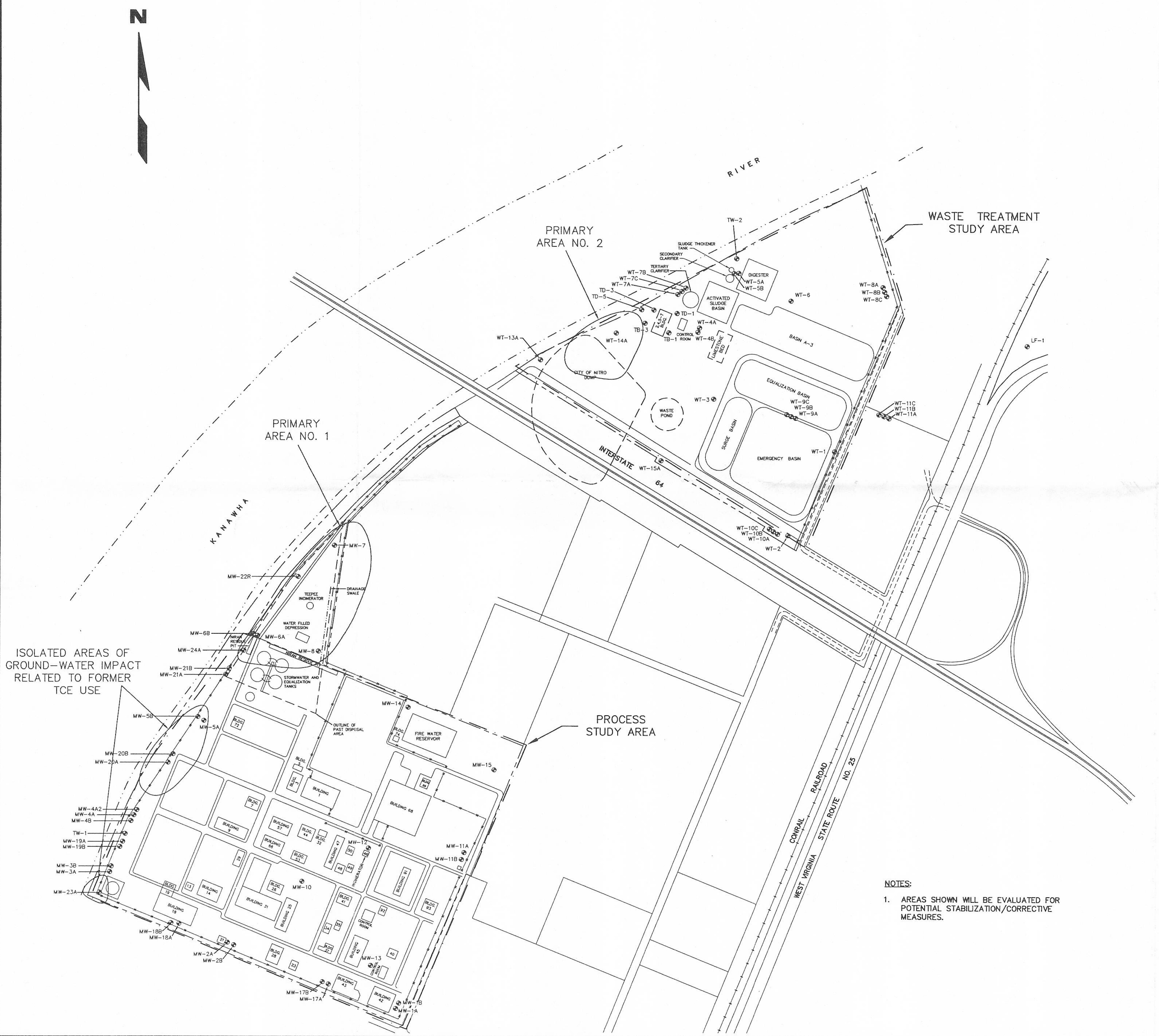
IDENTIFICATION OF PRIMARY AREAS OF CONCERN

NITRO, WEST VIRGINIA

Prepared For:

MONSANTO COMPANY

ROUX ASSOCIATES INC Environmental Consulting & Management	Compiled by: S.E.A.	Date: 12/95	Plate
	Prepared by: B.R.M.	Scale: SHOWN	7
	Project Mgr: M.S.T.	Revision: FINAL	
	Proj No: 06619J03	File No: 06619048	



LEGEND

WT-1A	MONITORING WELL LOCATION AND IDENTIFICATION
	BOUNDARIES OF STUDY AREAS
	APPROXIMATE PROPERTY LINE
	EDGE OF WATER
	DRAINAGE SWALE
	FENCE

400' 0' 400'

NOTES:

1. AREAS SHOWN WILL BE EVALUATED FOR POTENTIAL STABILIZATION/CORRECTIVE MEASURES.

Title:

IDENTIFICATION OF PRIMARY AREAS OF CONCERN

NITRO, WEST VIRGINIA

Prepared For:

MONSANTO COMPANY

ROUX ASSOCIATES INC *Environmental Consulting & Management*	Compiled by: S.E.A.	Date: 04/95	Plate
	Prepared by: B.R.M.	Scale: SHOWN	8
	Project Mgr: M.S.T.	Revision: FINAL	
	Proj No: 06619J03	File No: 06619048	